

QST

A MAGAZINE DEVOTED EXCLUSIVELY TO
CITIZEN WIRELESS



Amateurs from every district seen together for first time at A.R.R.L. National Convention. Left to right: K. B. Warner, 1AW-"KB"; J. K. Hewitt, Ex-2RK; A. D. McNaughton, 3HJ; B. W. Benning, 4XC; J. M. Clayton, 5ZL; V. M. Bitz, 6JD; C. H. Linsley, 7GK; Mrs. Chas. Candler, 8ZL-"OW"; H. J. Burhop, 9ZL-"HG"; A. J. Lorimer, Canadian 2BF.

PUBLISHED BY THE
AMERICAN RADIO RELAY LEAGUE



OCTOBER, 1921

20 CENTS

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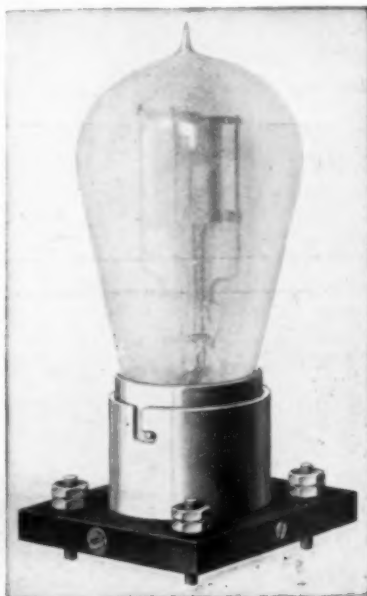
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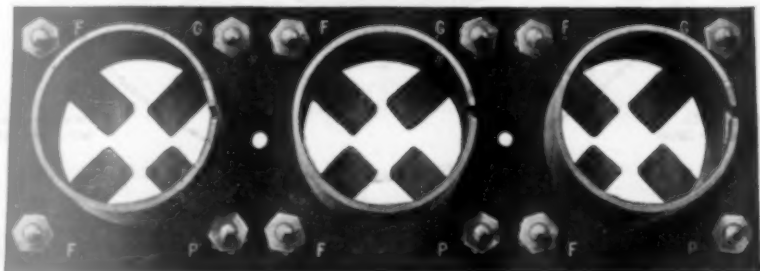


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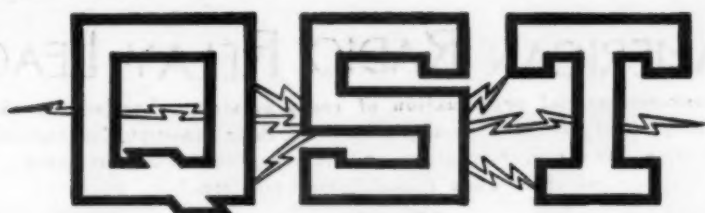
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The Official Organ of the A.R.R.L.

VOLUME V.

OCTOBER, 1921

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THE AMERICAN RADIO RELAY LEAGUE, Inc.

HARTFORD, CONN.

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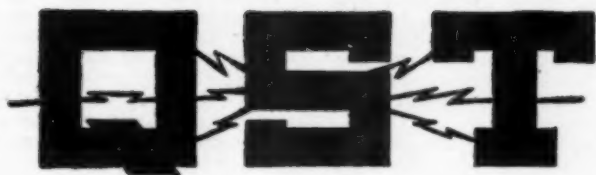
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A Magazine Devoted Exclusively to the Radio Amateur

Our First National Convention

OH, Boy, maybe our first national convention won't be remembered a while! Twelve hundred amateurs from out-of-town, representing every district and almost every state, augmented by several hundred local fellows; four big days so jammed full of amateur radio that nobody could keep up with it; fifty-odd exhibitors in a show so huge that one needed a week to do it justice; two big hotels full of bugs chewing the sock until break o' dawn every morning; so many records for attendance and representation broken, so many friendships made thru personal meetings, so much general good accomplished, that it is impossible to estimate it. These are just a few of the things about the A.R.R.L.'s First National Convention at Chicago, August 31 to September 3, that "stick out". It'll be a long long time before anybody who attended this meeting will forget it.

We're in rather a wild rush to get this QST out for you fellows, after the time lost at the convention, and the printer is yelling for "copy". All of the photographs and drawings we wanted haven't come in yet, and there is so much material to be gone thru to select what we shall print that it is rather a Hobson's choice. We can't get it all in print in the next several QST's but we shall do our best to give our readers the most interesting parts of it.

The center of activities was the beautiful north shore or Edgewater section of Chicago, the Edgewater Beach and Sheridan Plaza hotels housing most of the delegates, while the exhibition and lectures were at the immense Sixth Regiment Armory at Broadway and Thorndale St., a few blocks up, with the various technical and business meetings at the Swift School Auditorium, around the corner from the Armory. 9ZN is just north of the Edgewater Beach Hotel and was of course a center of interest—we hope there wasn't anybody who missed the chance to inspect this really splendid station.

The program for the meetings was

published in the two previous issues of QST and we hardly have room to say more than a few words about each of the speakers, for there were many—so many that a feller couldn't find time or keep awake long enough to hear all of them. If anything the programs were *too* full, as it was hard to find a chance to chew the rag with old friends.

At 10:30 on the morning of Wednesday, August 31st, Chairman R. H. G. Mathews called the opening session to order, and addresses of welcome were delivered by



The Edgewater Beach Hotel

N. C. Bos, Chicago City Manager, on behalf of the local organization; Corporation Counsel Sawtelle, representing the mayor of Chicago; Coroner Peter M. Hoffman, speaking for Cook County; Chief Radio Inspector W. D. Terrell, spokesman for Secretary of Commerce Herbert Hoover; and Lieut. Parmenter, U.S.N., of "NAJ", representing the Navy Department. The main address was the formal opening of the convention by our president, Hiram Percy Maxim, which, because it sounded the keynote of the meet and is well worth study, we print in full:

Our President's Opening Address

"Mr. Chairman and Fellow Amateurs—

"We are gathered here this 31st day of August, 1921, to perform an action which

will make history. Chicago has been the scene of many historical events in the past, but I do not hesitate to say that the event we are to participate in here this week will, in the years to come, take its place beside any other great event that has happened in Chicago.

"For the first time in history the citizens of the United States and Canada interested in privately-owned and operated radio come together in council. Every individual is of course not here, but representatives from all over the United States and Canada are here, and such a thing has only been a dream up to this time.

"As we meet and open this great convention it is indeed an historical event. I cannot but feel that in the years to come much will be said of what we do here at

continent-wide means of instantaneous communication, and no man may say we shall not make it world-wide.

"Every one of us present at this great A.R.R.L. meeting this week has reason to consider himself and herself fortunate. It is no small distinction to be one of those who make history. I am sincerely sorry for those who did not come. They have missed a great opportunity. In my own case I feel it a considerable honor to be called upon to preside at this opening of the first American Radio Relay League National Convention. It leads my mind to turn back to other meetings I have attended and I am again impressed with the tremendous rapidity with which events advanced in radio. It seems but a very short time back that I took part in a dis-



This picture ought to have been entitled "SOME of the DX Men," for it shows only a little handful. But as it is they are there from every U. S. district and Canada.

this first convention. We are striking out into the unknown, and even the smaller actions which we take here during the next few days will weigh heavily in the future, for they will establish precedents and standards. We must try our best to regard things in a large way, with this perspective of the coming years before us. Let us not forget that we are pioneers, blazing a way that many are to follow. Our responsibility is great and we must so regard it. It is one thing to repeat what has already been done but it is an altogether different thing to do what has never been done before. Such a thing as you see before you here today has never before happened in the affairs of men. Not only is it a great pioneer effort in radio history but it is a great pioneer effort in political history. We American and Canadian citizens assembled in this room this morning represent the pioneers in the development of something totally revolutionary in the art of communication. The like of what we are doing and propose doing had never crossed the brain of man a short ten years ago. We already have a privately-owned, absolutely free,

cussion as to whether it would be practical to get the amateurs of the city of Hartford, Conn., to meet together, get acquainted and organize an orderly system of operating. There was doubt on the parts of many that such a thing could be done. But a meeting was held and it was done. Then some of us wondered if we could get the amateurs of two neighboring cities and also those in between to meet and agree upon some orderly system of operating and handling message traffic. The cities were Hartford, Conn., and Springfield, Mass., distant twenty-six miles. It was felt sure by many that this was going too far as it would be impossible to induce such a large number of amateurs to exercise self-denial and control even for the good of the many. But again, it was done and message traffic was started. Probably similar pioneering efforts went on in other parts of the country at the same time.

"Then one day came the idea of making the organization national. And that day was born the American Radio Relay League. From money advanced by the Radio Club of Hartford and by individual

subscriptions all the amateurs in the government call-book were addressed and asked to say if they would join together in a national amateur organization for the handling of friendly relay traffic and for orderly and lawful operating. These amateurs located all over the country responded immediately and favorably, and a practical working organization came into being. From the very first a policy strictly limited to the amateur was observed. Absolutely no commercial or money-making influence was permitted to enter. The organization of these amateurs must rise or fall as a purely amateur effort. A tremendous amount of hard work was called for and with no possibility of financial reward. In this great struggle for an ideal the names of C. D. Tuska, the first secretary and editor of our magazine "QST", of A. A. Hebert, our first vice-president and general manager, who laid out our first traffic organization, J. O. Smith, our first traffic manager, and R. H. G. Mathews, our Central Division manager, stand out prominently. These men gave wholeheartedly of their time, their enthusiasm, and their money. We advanced and grew at a rate that exceeded even the wildest hopes. Threatening legislation was met and successfully opposed and when finally the great World War came this amateur organization was able to give to its country in its hour of direst need a great body of trained and expert radio operators.

"Then it came to be proposed that all radio citizens in a given district embracing several states come together, get acquainted and discuss the question of orderly operating. This seemed visionary to



many since the railroad and hotel expenses would mount into the dollars instead of into the cents. But it also was done and there came to pass the conventions of the Central Division of the American Radio Relay League in Chicago a year ago and of the Midwest Division in St. Louis last winter and the several conventions of the different radio districts.

"And now, in less than one year, we

come to the greatest attempt of all—a national American Radio Relay League convention of all our divisions, both American and Canadian. I am hoping there will be present a member from our distant Alaskan Division. If he is here we will have the profoundly impressive situation confronting us, that in August of the year 1921 we have grown not only to national but to continental proportions. Organized



citizen radio encompasses one of the great continents of the earth, the North American continent. Truly this is a wonderful matter to contemplate.

"How much farther our indomitable American spirit shall carry us remains to be seen. Already is our Traffic Department at work upon transatlantic tests. Who shall say they shall not succeed, and before we realize it, the continent of Europe be linked to that of North America. Indeed impressive will that day be when private citizens may communicate without cost from the shores of the great far-flung Pacific on the west to the limits of civilized co-operation and good government on Europe's east. I hope I may live to see that day.

"And so we see and appreciate the great importance and seriousness of our undertaking here today and the days that are to follow. Let me urge upon you, my fellows of the American Radio Relay League, to try and keep constantly before your minds in all your actions here this week the infinite possibilities of the future, and to permit thoughts of these great possibilities to be the guide back of your actions. Let us all look at things broadly, and what is equally important, let us strive to overlook those things which are petty and small.

"This is the greatest meeting we organized amateurs of the United States and Canada have ever attempted. Let us be steadfast in our faith and loyalty to one another. Ladies and gentlemen, I have the honor to declare the First National Convention of the American Radio Relay League opened."

Message from Hoover

Just then a radiogram arrived from the Secretary of Commerce and was received by the meeting with cheers. It read:

"The Department of Commerce is by the authority of Congress, the legal Patron Saint of the Amateur Wireless Operators. Outside of its coldly legal relations the Department wishes to be helpful in encouraging this very important movement. I am asking Mr. Terrell, the head of our Radio Division, to go to

and Prof. G. D. Robinson. Prof. Achatz, considering the pending legislation, said that "if the bill goes thru in its present form apparently the wave lengths, power and decrement are subject to control of the commission, and they may keep us jumping around from one wave length to another, increasing and decreasing our power. I don't know if it would do us any harm if they made us adhere to the decrement any more strictly, but at any rate it would place the amateur radio operator



A view of the Radio Exposition. This picture was taken during dinner-hour when most of the bunch was out eating.

Chicago to learn from you where the Department can be of service.

"Herbert Hoover."

Then followed addresses by Radio Inspector L. R. Schmitt, Mr. Preston of the Bureau of Standards, and Dr. H. W. Hunt, speaking for the National Council of Boy Scouts of America.

At the afternoon session the convention buckled down to serious business and were addressed by President Maxim on "National Organization and the A.R.R.L. Spirit", in which was pointed out the need for observing Benjamin Franklin's advice: "Let us all hang together, because if we don't we will hang separately." Then followed M. B. West on "The Position of the Amateur Radio Man," and a masterly paper on "Legislative Conditions", which we hope to publish soon, by Chas. H. Stewart, A.R.R.L.'s legislative committee. The subject was thrown open to discussion and remarks were made by Messrs. F. F. Hamilton, Prof. R. V. Achatz, R. C. Higgy, C. N. Crapo, P. E. Wiggin, L. B. Henson,

under a very severe disadvantage, and it seems to me, from the standpoint that Mr. Stewart has so well brought out, that this convention should go on record as approving the recommendations of the legislative committee and the Board of Direction. I think that it should be more than a matter of just consent. I would like to present it as the matter of a motion to that effect, if I may place that before the house, that the convention assembled approves the recommendations of the committee and the Board of Direction as outlined by Mr. Stewart." After discussion had cleared up several points, the motion was seconded, put to the meeting by Chairman Mathews, and carried unanimously.

A discussion of police broadcasting work followed, with talks by Traffic Manager Schnell, Division Managers Corlett, Bessey and Entwistle, L. C. Maybee of the Northwest Division, describing the work at Portland and Tacoma, with remarks by L. B. Henson, representing the Police Department of Dallas, Chief Inspector Terrell, and Mrs. W. E. Woods of 9LC. Mr.

Henson pointed out the need for a uniform plan of organization for handling such police broadcasting, and made a motion that President Maxim appoint a committee to work out details for a plan of action, to be endorsed by the League. 5ZX seconded, and it was passed unanimously. The report of the committee will be published in QST when completed.

F. M. J. Murphy, 8ML, then gave an interesting paper on Cleveland organization and the difficulties that were being overcome there; Mr. F. J. Walker, editor of "The American Jeweler", told of the possibilities of making radio converts of some 23,000 retail jewelers by interesting them in the use of radio for time reception, pointing out the opportunity not only of being of service and increasing our prestige but of selling outgrown apparatus; K. B. Warner, editor of QST and League secretary, talked on the relations of QST and the League members who own it, and told of several new fields of work that the League was entering.

Power Factor!!

After an intermission just long enough to grab off some nourishment the gang was back hard at it for an evening session devoted to the technique of spark operation. This was opened with a comprehensive paper on "Some Factors in Antenna Design for Two Hundred Meter Work" by F. F. Hamilton, 9ZJ—an excellent paper the use of which we hope to have in our forthcoming Antenna Symposium number. He was followed by M. B. West, pre-war 8AEZ, who started out to talk on "Spark Transmitters" but drifted into "Power Factor". Now be it known to you, gentle readers, that there resides on the Pacific coast one Ellery W. Stone, who has pre-

supporters of the two main participants rushed to their respective colors, the air was full of cries to the chairman for recognition, and at one time we witnessed the spectacle of six good men and true talking their respective versions of Power Factor at the same time, three of them on the platform trying to draw diagrams on the same blackboard while they talked. Oh boys, it was good! Now we don't intend



Jack Colligan, "The Young Squirt from Dallas," who endeared himself to all.

to take it upon ourselves to try to untangle the argument—our role is that of the humble recorder. We've got a copy of the proceedings of the convention before us as we write, and we're going to try to stick to facts! Mr. Stone based his contention concerning the P.F. on the premise that it was unity in any A.C. circuit in which inductive and capacitive reactances cancelled. Mr. West ignored inductances and capacities and confined his view of the matter to the relation of real watts to apparent watts. It really looks like Mr. S. E. Anderson's excellent paper on power factor in series power circuits, recently published in QST, left some things to be said on the phenomena in radio circuits, especially in freely oscillating circuits. Mr. West contended that measurement of the apparent power in a circuit by multiplication of its current by the voltage across it always gave an excessive value, and that it approached a sensible value only as power was dissipated either by resistance or by coupling on a radiating circuit, etc. At about that stage in the game there entered Mr. Simpson (QRA?, OM, what initials?), Mr. P. E. Wiggan, and Prof. G. D. Robinson of Annapolis. Mr. Simpson pointed that out that when



viously manifested a slight interest in this subject. (Flock o' HI's!) Mr. Stone was there, had in fact come all the way from Frisco to debate on power factor. He followed Mr. West as a speaker on the same subject, and then the fight was on! Without doubt this debate was the main attraction of the convention. Staunch

the gap breaks down the voltage is at maximum; the current is zero at the start and rises to maximum while the voltage is reducing to zero, and that the power factor is zero. Which Mr. Stone countered by inquiring how one could get power in an antenna if there was no power in the supplying circuit? Mr. Simpson said that as soon as an antenna was coupled on, the power factor was no longer zero. Quoth Mr. Stone: "I'll say it's not—it never was zero!" And so it went, until it began to appear that the confusion lay in the definition of power factor. Mr. Robinson to the fore, then, with the helpful suggestion that in C.W. work the ordinary "A.C. theory" concept of power factor was OK but when the term is used in connection with a freely oscillating circuit it must be re-defined, for by its common definition it means the relation between the real and the apparent watts, whereas real watts, he says, cannot be measured in a freely oscillating circuit, for the energy is in the circuit and no power is being supplied it; and he would define power factor as the factor which depends upon the relation between stored energy in the circuit and the actual energy consumed in the circuit. Finally Mr. Stone suggested that it be put up to the Bureau of Standards to answer, a motion was made and put to the assembly to do so, and carried unanimously. Accordingly, the following telegram was dispatched:

"Radio Section, Bureau of Standards, Washington, D. C.

"For information of National Convention of A.R.R.L., please wire our expense immediately: In a freely oscillating radio cir-



cuit, and in a forced oscillating circuit tuned to resonance with the impressed frequency, if the inductive and capacitive reactances are equal in magnitude and opposite in sense, is the power factor unity? One side contends that according to present alternating current theory the power factor is unity, and reactances are equal and opposite. Other side contends that resonance is that condition in circuit which causes power factor to automatically assume that degree necessary for the

complete dissipation of the power applied to the circuit."

It will be noted that Mr. Stone based his argument solely on modern a.c. theory, whereas Mr. West was proposing a new theory—a sort of revolutionary definition—and it was expected that the wire to the Bureau would bring back the conventional a.c. theory reply. But it was worse than that. He answered 1; which, altho it arrived the next day and the following action took place that night, we beg permission to present here in order that the continuity of the power factor story may be uninterrupted:

"In a single freely oscillating radio circuit, period of the oscillating current is such that capacity reactance is equal in magnitude and opposite in sense to inductive reactance, to a high degree of accuracy, provided resistance is small compared with either reactance. In a forced oscillating circuit the condition for maximum current and maximum power dissipation for a constant impressed EMF is that the capacity reactance and inductive reactance be exactly equal and opposite at the applied frequency, whatever the resistance. Then this current is in phase with the impressed voltage. Phase angle between impressed voltage and resulting current is always such as to dissipate as much power as is supplied to circuits regardless of whether circuit is in resonance or not."

Supporters of both Mr. West and Mr. Stone hailing this as complete vindication of their side, it was necessary to appoint a committee to put it into plain English. Mr. Maxim was made chairman, and with Messrs. Jansky, Robinson, Skifter and Stewart, retired to consider the matter. After deliberation they returned to the meeting to ask certain questions of the principals. These took the form of a mock "hearing", each being required to stand and hold up his right hand while answering. The questions were serious, however, and were an effort on the part of the committee, we are told, to make it self-evident to the participants that the subject being considered was an impossible one. Again they retired, and after struggling with it another hour, put in an appearance with the following signed statement:

"As a result of the study of the answers to the questions asked of Mr. West and Mr. Stone it is the unanimous opinion of the Board that the two gentlemen are not using the same nomenclature and that they are not reasoning from the same premises.

"And, furthermore, it is the unanimous opinion of the Board that the term power factor, in the generally accepted meaning of the term as applied to power circuits, has no significance when applied to a freely oscillating circuit taken as a whole."

Nearly everybody thought it was too bad that a more definite decision could not be announced, because, as the Chairman announced, neither Mr. Stone nor Mr. West could cry himself to sleep that night. Circulating among the gang to obtain impressions after the "big fight", we found two camps: (1) those who agreed with the committee that an attempt to measure power factor by multiplying the current thru the circuit by the voltage across the resistance thereof was a fallacy, and that it could no more properly be done than by using the voltage across the inductance or capacity—i.e., the three components are in every radio circuit and all three must be thrown out when measuring watts, if one wants to get the measure of voltage across the circuit as a whole, and as the three factors are all there is to a radio circuit, the problems resolves itself into a hopeless one; (2) those who insist that the every use of the term power factor was predicated on its measurement of the power used in the apparent resistance of the circuit; that in transmission systems, etc., where the power factor was unity it meant that the inductive and capacitive reactances had cancelled and that the power in the line was expressed by the volts across the resistive load, times the current thru it—and that therefore recognized practice would have been authority for the committee to agree that if the current in a freely oscillating circuit is in phase with the voltage across the pure resistance thereof, the power factor is unity.

There is something strangely reminiscent of Mr. West's contention in that last sentence of the Bureau's, tho. We dunno.

Getting back to that first night again, after the wire went off to the Bureau, our treasurer, Mr. A. A. Hebert, gave a simple lesson in elementary arithmetic at \$2.00 per year—explaining how far he had to stretch A.R.R.L. dues and urging the members to make prompt renewals of their expiring membership. Mr. Thomas Appleby, of Philadelphia, gave an entertaining description of the excellent station of H. A. Beale, Jr., of Parksburg, Pa., 3ZO, illustrated with complete views of all of the several installations. Some station! J. K. Hewitt, 2RK, followed with a piece-by-piece description of his old rock-crusher, and notebooks and pencils were much in evidence. Then came a paper by Paul F. Godley on "Some Impressions Concerning Spark Reception", and the first big day was done.

These technical papers are all very valuable, and they will be printed as soon as possible. It is really impossible in this review of the convention to do more than give them passing mention.

Everybody There

The first day found a whale of a gang present, with more coming by every train, and a fleet of busses was meeting incoming trains at all depots. At previous conventions we had anxiously wondered whether or not perhaps we wouldn't get a man present from every district. This time there wasn't the slightest doubt of it. If you question it, look at our cover, proof for the world. At least half a dozen 1's, several times that many 2's and 3's, 4XC and 4BQ for the 4th, (were there any



5's?—waddaya say, Dallas?), Bessey 6ZK, Bitz 6JD, and Stone for the 6th; Linsley, Maybee, Weingarten and goodness knows how many more from the 7th, including one chap who rode the brake-beams from Wyoming; and 8's and 9's from 9WU to 8ZW—just by the hundreds. Say but it was good to get together, and really we feel that after all was said and done, and a nerve-racked empty-pocketed gang returned to their homes, the thing that is best remembered and that helped most of all to make it worth while is that meeting we had with "the other fellow."

Many a poor bug hated to roll out the next morning but nobody dared to miss a minute, and 10:30 of Sept. 1st found the bunch in the Butterfly Room of the Broadway Armory, where a most interesting talk was delivered by Prof. C. M. Jansky, Jr., of 9XI, University of Minnesota, "Some Notes on V.T. Continuous Wave Transmitters" and "On Organization of Radio Stations for Schools and Colleges". In the first part of his talk Prof. Jansky presented charts showing carefully plotted weekly comparisons of 9XI's 100-watt C.W. set and 300-watt spark set in number of calls completed, total mileage, and average mileage per call. The C.W. was shown to be much the superior. This paper will be published soon. After the lecture the meeting was thrown open for questions and discussion. It was interesting to note that the questions for the most part were practical ones—fellows had benefitted by that paper and were going to find out how to build a set like that.

Club Work

The afternoon saw a meeting under way at Swift School where everything that could be thought of relating to club work was studied. Mr. Maxim led off with a keynote address on the relation of affiliated clubs to the A.R.R.L. He was followed by F. Clifford Estey, president of the Essex County Radio Assn., of Salem, Mass., who told of club organizations in various parts of the country as studied in his trips; F. M. Corlett, Manager of the West Gulf Division, spoke on Texas organization and the splendid work of the Dallas Radio Club; Mr. Bessey told of the equally good work in the Pacific Division; and F. F. Hamilton, of Indianapolis, for years a scoutmaster and interested in educational work, read an excellent paper on "Radio Clubs for the Younger Element". V. M. Bitz, 6JD, all the way from Los Angeles as a representative of the Southern California Radio Assn., brought greetings from Major Dillon, formerly 9th district radio inspector and now the guardian of the 6th, and told of the work his club is doing and the new station they are planning. A paper by N. C. Bos, Chicago City Manager, was then read, explaining the Chicago Plan as applied to local clubs and giving practical pointers on its application. Mr. M. H. Pancost asked for suggestions on securing material for club papers and extemporaneous talks on this subject were made by Boyd Phelps, editor of "Kick-Backs", E. B. Duvall, editor of "The Radio Condenser", and P. E. Wiggin, of the staff of "The Oscillator", of Pittsburgh.

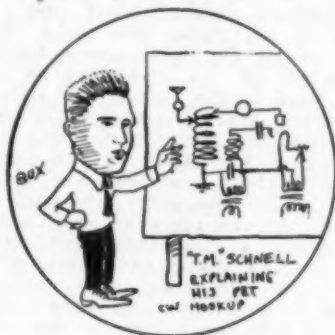
Many delegates from clubs were present at this meeting, and altho a discussion of club work is rather dry when compared with the excitement of a unity-zero debate, it is such serious work that makes our fun possible and we are hopeful that some good suggestions and ideas were brought out in the discussions.

Immediately at the adjournment of the club session the Operating Department convened a meeting, with Traffic Manager Schnell presiding, to dig into traffic regulations, interference prevention, etc. A goodly number of the division managers were present: C. H. Stewart and his assistant, E. B. Duvall, of the Atlantic Division; R. H. G. Mathews, Central Division; F. M. Corlett, West Gulf; A. E. Bessey, Pacific; A. J. Lorimer, St. Lawrence; Boyd Phelps, Dakota and Winnipeg Divisions; G. R. Entwistle, New England; J. M. Clayton, Delta; and L. A. Benson, Midwest Division. Mr. Schnell presented new operating regulations designed for the traffic department of the League, and threw them open for discussion. The stenographer's record thru some sixty pages gives proof that discussion verily took place—on hours of operation and their division, message form, and their number-

ing, routing, counting, delivery, operating procedure. Suffice it to say that the matter was well thrashed out in popular session—the very best way to determine the regulations that shall govern our use of the air—and at a meeting of our Board of Direction on the following day arrangements were made to publish and distribute them in the near future to all League members.

C.W. Night

In the evening session, which was devoted to C.W. work, after the power factor matter was turned over to the tender mercies of the Chair's committee Mr. E. W. Stone again entertained with a very interesting story of how Moorhead A-P tubes are made, photographs circulating



thru the audience helping to show the processes. Quizzed about radio frequency amplification, Mr. Stone said that r.f. amplification was possible on 200 meters with A-P tubes if tuned coupling circuits were used instead of resistance-repeaters, explaining that the poor results usually had on 200 meters were due not so much to excessive grid-to-filament capacity in the tube as they were to the low impedance of the graphite repeating resistance, which bypassed the radio frequency by a surface effect exactly as such rods do when used as a protector against high-frequency surges on a transmitter.

Followed R. C. Higgy, 8IB, of Columbus, Ohio, who described his practical experience in C.W. work, giving real practical pointers, and recommending the circuit explained by 1DH in July QST.

Then came P. E. Wiggin, who, altho he had taken part vigorously in most of the talks theretofore, now buckled down to real business with a comprehensive paper on "The Antenna Circuit". Who said there was a dearth of data on aerials? Wiggin had an hour's worth—it is promised for our antenna symposium number.

The next speaker was one F. H. Schnell, a recent C.W. convert, who explained his pet circuit, gave constants, and told just how to do it. Schnell inaugurated what

would have been a grand C.W.-vs.-Spark rumpus if it hadn't been that the next speaker, K. B. Warner, used up the rest of the evening reading two letters from Speedo Vermilya, 1ZE, in which the latter in characteristic style took careful aim and endeavored to shoot C.W. off the amateur map, and in trying to answer him in a gentlemanly manner. It was midnight when this last talk started, and by the time it finished everybody was blind, so retreat was sounded and the second day ended well into the third.

We almost forgot to say that both of the technical sessions were jazzed up a bit by interspersed vaudeville. We are reliably informed that Porter T. Bennett of Dallas, Tex., fell in love with the chocolate-colored lady who entertained, and had to be restrained by his companions.

The morning session of Friday the 2d was started with an address on "Radio Engineering as a Profession", by Prof. R. V. Achatz, and the balance of the time was devoted to a continuation of the Spark-C.W. discussion of the previous night. Messrs. Stroebel, Jansky, Bitz, Wiggin, Hanson of 9XM, and Damerin of 9XD, talked, but most of them favored C.W. and, as Chairman Jansky said, "it takes two dogs to make a fight and we have only one dog at this meeting". Mr. Hanson we believe expressed the sentiment of the meeting, that the only true test will be a comparison of the actual work of the coming winter.

The Ball Game

A ball game between the Chicago Council and the A.R.R.L. Board of Direction was scheduled for Friday afternoon but, in spite of Captain Schnell's preparatory work, President Maxim felt that the Board had a great big session before them that would take all the available time if they were to make the boat-ride in the evening, so the Board defaulted the game and went into executive session at the Edgewater Beach Hotel, where the most completely representative gathering in its history took place. All directors but one were represented, and all but three were there in person. Around that little table were gathered our directors from all over the country: Maxim, Schnell, Kruse, Clayton, Bessey, Stanley, Hamilton, West, Anthony, Stewart, Hebert, Corlett, Warner. Routine League business was handled, the most interesting piece of business being the arrangements made to send Paul F. Godley overseas in December to listen for the Transatlantic Tests, as told elsewhere in this issue. Rev. Sebastian Ruth, of St. Martin's College, Lacey, Wash., was appointed to the Board to represent the Northwest in the remainder of the unexpired term of former director J. O. Smith.

The bunch was all hanging around the wilds adjoining 9ZN, waiting for the

scheduled ball game, so an impromptu team of DX men got up to do battle with the Council, with the following line-up:

Council		DX Men
Bos, 9ECO	1b	Carpenter, 9XI
Schoenwolf, 9AO	3b	Otterholm, 9HM
Slicer, 9NW	rf	Wiggin, 8XH
Mathews, 9ZN-WO	p	Benson, 9ZB
Frost, 9AEB	lf	Benning, 4XC
Zeller, 9AU	cf	O'Rourke, 9HT
Gunther, 9ZN-GG	c	Leavenworth, 9WU
J. Scholtes, 9AR	2b	Schlaack, 8OJ
Adams, 9AT	s	Bitz, 6JD

Our first regret is that we didn't have at least the privilege of being water-boy for the Board at its game, but since the Board couldn't play our main regret is



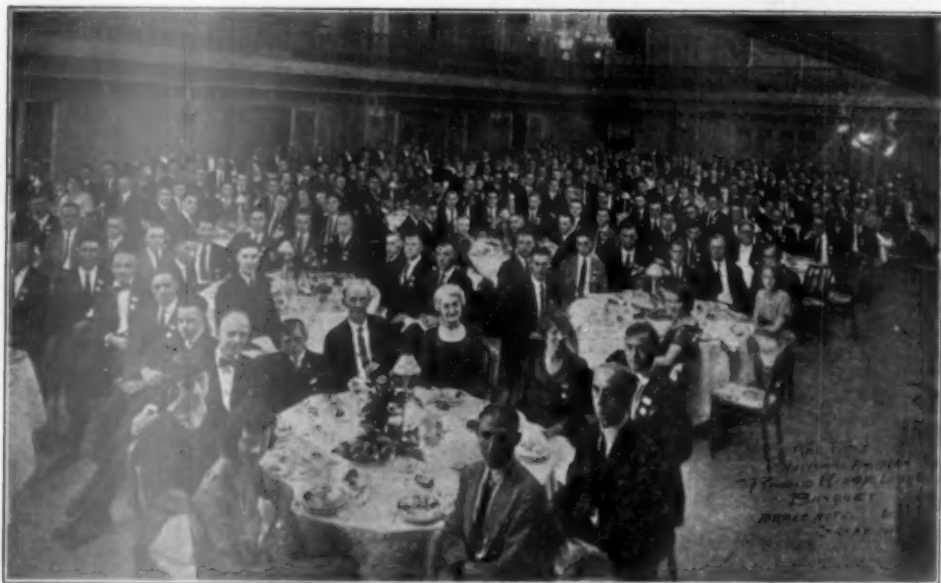
The beautiful Convention Badge.

that our duties there prevented us from trying our reportorial hand at a ball-game, something we have never essayed. We have to pass on the news second-hand, without a single thriller. All we know is that at the end of the scheduled five innings it was one and one, so it was extended to 7 frames, whereat somebody went to pieces and the Council came out victorious, 4 to 1.

The S. S. "Theodore Roosevelt" was chartered for a lake ride for the evening, and about eight hundred of the fellows and sundry O.W. provided by the local boys had an enjoyable cruise in the cool lake breezes. It was a much-needed relaxation after three intensely strenuous days, and it did a world of good. Fellows who had been so continually on the go that

they hadn't had a chance to sit down and talk with chums found here the opportunity, and groups all over the boat with heads close together in little circles showed that plans were being made for a busy winter. About three tons of sandwiches and lemonade were put forth for consumption, and a jazz band furnished music for dancing under the stern direction of a ship's officer who directed everybody to "keep to the right" in approved traffic-cop style. Teschan, of Milwaukee, amateur magician as well as amateur radioist, entertained with a few tricks from his bag during intermission, and the op in the static-room had plenty of company.

old A.R.R.L. fellowship reigned supreme! At the speakers' table sat the guests and most of the members of the Chicago Council and the A.R.R.L. Board, with Mr. Mathews acting as toastmaster. That wild Texas gang broke out red bandanas and added to the color, while in one corner was a table of New York manufacturers who raised their voices in loud demand for "On the Sidewalks of New York" when popular songs were sung. We don't know what the hotel attendants thought of us—they looked as if they thought we were a noisy mob of bums—but we had a good time, art. After the tables were cleared away members of the company of Ned Melroy,



A view of part of the Banquet

On Saturday morning educational lectures were delivered at the Armory by H. M. Anthony on "Laws Governing the Flow of Electricity in Conductors", and by J. M. Miller on the "Development of Electrical Measuring Instruments." In the afternoon a stunt party was held in the Armory, with many hundreds of dollars worth of apparatus given away, but we were seizing that last opportunity to get around to see the exhibits and have no record of the winners or what they carried home with them.

The Banquet

And in the evening the banquet, a beautiful affair at the new Drake Hotel, the last word in modern hostelry. After four days in town many had to leave before the banquet, so that the attendance was not as large as it might have been, but some four hundred met there and good

entertainers who had livened up the previous meetings, staged a skit entitled "A Visit to the QST Foundry". It was a perfect scream from start to finish. Lights came on to reveal four desks, prominently labeled "Schnell", "Adams", "Warner", and Peg-the-beautiful-stenographer. "Warner", with sleeves rolled up and confronted by a pile of correspondence as big as life, loudly demands to know of "Adams", combination lady-killer and advertising manager, how the hexx advertising is coming in and allows that by gorry this next issue of QST just naturally has to be out on time! (This one won't, brother; we lost too much time in Chicago.) The three cornered conversation from then on permitted the reading of typical letters from the A.R.R.L.'s daily mail that served to introduce many of the brethren and their pet topics, with much fun and many a good joke. Some of it was so true to

life that we were puzzled as to how these "secrets of state" could have leaked out, until we recalled that Schnell had been in Chicago a week before the convention opened—and he hadn't been idle! "Mr. Maxim" dropped in to see how everything was getting along, and during lunch-hour "T.O.M." himself paid the office a visit, the curtain ringing down as old Beezelebebeats it out the door after leaving a sign on "Warner's" desk inquiring "Say, Son, when are you going to get QST out on time?"

Following this atrocious take-off on our honourable efforts short addresses were made by the real Warner and the real Schnell, by Commander W. F. Jacobs, U.S.N., of the Great Lakes Radio School; and by Master Jack Colligan, youngest delegate attending the convention and youngest member of the Dallas Radio Club, who made a real speech and warned all comers to watch the smoke of his hometown's club, with terrific applause. Comic slides by the Maryland Radio Assn., and the Washington Radio Club were thrown on a screen and devoured. The roll of the affiliated clubs was called, and altho only a third of the convention's registration was present at the banquet, eighty of the affiliated clubs, in thirty-six states, were found to be represented. That was a splendid showing! Followed, then, farewell addresses by Bessey of Sunnybrook Farm, F. F. Hamilton, F. C. Estey, S. Kruse, Coroner Hoffman, A. A. Hebert, N. C. Bos, H. M. Anthony, Mr. Edw. Glavin of wireless-torpedo fame, "A. P." Stone, and Show Manager N. E. Wunderlich; after which the Toastmaster wished all God-speed and a happy and safe journey home, with the hope that when next the convention returned to Chicago it would find everyone there again—and with 6ZK leading three rousing cheers and a tiger for the Chicago Executive Council, among great applause, the First National A.R.R.L. Convention passed into its place in American Amateur Radio history.

The Show

Now altho in the preceding summary we have boiled down the contents of 563 pages of typed record made by the Convention Reporter, and it seems that it surely was more than enough to keep everyone busy, it was only a small part of the affair. The big remainder was the Radio Show. Frankly, we don't know how to describe it. "Radio Wonderland" is right! It was stupendous, beautiful, enormous in size, absorbing in its interest! The Broadway Armory is an immense building, capable of accomodating eight thousand people when used as a dance floor. Imagine it for yourself, brilliantly decorated, and surrounded with a half-mile or so of booths in which the cream of America's

manufacturers exhibited their products for the inspection of the cream of America's amateurs. Many a fellow saw something he couldn't get along without and had to wire home for money to buy it. Such a show is not normally looked upon by exhibitors as likely to pay for itself—it is generally considered an advertising expense. But this one was an exception and there are many we know who did a remarkably large business during the four days. Many thousands of dollars worth of equipment were ordered for the coming



Three QRMers—Mrs Candler, 8ZL; Ken Hewitt, 2RK; and Traffic Manager Schnell.

—Photo by 9ZC

winter season and, directly and indirectly, the return to the exhibitors cannot be estimated. Of course every amateur who attended benefitted also. It isn't often that one has the opportunity of inspecting half a dozen makes of rotary gaps or an equal number of regenerators, before making a purchase. It was a good time to buy and that is why buying resulted. The exhibit was open to the general public and thousands attended, altho at this writing we do not know the figures. All the exhibitors had literature on their products, and the average amateur found he had collected about four pounds by the time he had made the circuit.

It's beyond us how we can do justice to fifty interesting exhibitors in a single issue of this little magazine. If we're going to have any room for "Calls Heard" we'll have to use only a line or two on each.

Amrad had their new line of receiving apparatus on display, a description of the tuner appearing elsewhere in this issue, and Miss Eunice Randall, 1XE's O.W., gave a "canned" talk while Mrs. Estey sweetly distributed solid silver key contacts as

souvenirs. The radio section of the Associated Manufacturers of Electrical Supplies, a newly-formed organization of radio manufacturers, had a joint exhibit displaying the products of its members, among whom are Pacent Elec. Co., Acme Apparatus Co., Wm. J. Murdock Co., Clapp-Eastham Co., Westinghouse, Continental Radio & Elec. Corp., etc. Prizes worth a thousand dollars were given away in drawings by these firms. In the American Radio Sales & Service Co.'s booth the most imposing thing was their he-O.T. and the most interesting, to us, a V.T. circuit-driver. Adams-Morgan and the Continental folks had a joint exhibit displaying the RA-10, the Paragon Super-Heterodyne, and the new Adams-Morgan 'phone, a description of which appears elsewhere herein. At the A.R.R.L. booth, very kindly looked after by Mr. B. W. Stolte of the Chicago Executive Council and ably administered by Messrs. Klorig, Paine and Gersch, applications for membership in the League were accepted, September QST and A.R.R.L. message blanks and emblems were on sale, and the beautiful "Summer-Achievement" cup was on exhibition.

Bill and Benny, of the Benwood Twins, kept the air stirred up with a mean gap, the new Benwood sink, one among many of their displays. The Chicago Radio Laboratory exhibited their entire line of products, from the Hyrad sync gap to the Multiceiver, including the new "Transceiver" a two-way set using the same tubes for both transmitting and receiving. Chicago Radio Apparatus Co. had an interesting display, featuring the "DX" line of receiving equipment, and the beautiful apparatus of The Radio Shop, of San Jose, Cal. Connecticut Tel. & Elec. Co. showed their new detector tube, which is described in detail in this QST. Central Radio Co. had a most attractive display featuring their Lightning service and an exhibit in which the main attraction perhaps was the Mi-Kerm gap. Crosley Mfg. Co. displayed their cabinets and ingenious new dollar condenser and socket. The Commonwealth-Edison Co. of Chicago announced their entry into the radio field and displayed a line of apparatus, the most attractive of which perhaps was the new Kennedy long-range set, surely a beauty for workmanship.

Diamond State Fibre Co. exhibited their products, with samples of pieces of equipment in which they were put to good use. Electric Specialty Co., represented in Chicago by Mr. A. A. Howard, had a complete line of motor-generators, separate machines, dynamotors, etc., for every kind of C.W. work. Experimenter Publishing Co. had a corner booth at which their two magazines were on sale. The Chicago Executive Radio Council kept open house

in their stall, and "Radio Topics" was everywhere to be seen.

Formica Insulation Co. had an attractive display showing the many uses to which Formica may be put, and gave away cigarette holders as well as dispensing liquid Formica to thirsty travelers who knew the combination. Herbert H. Frost, in his new capacity as manufacturer's representative, showed a beautiful display, featuring Remler products. The Federal Tel. and Tel. Co.'s booth was in charge of R. H. McMann and their always interesting family of telephone switches proudly displayed a few new members, as well as the rest of the Federal line of transformers, etc., and the products of the C. D. Tuska Co. General Insulate Co. showed hundreds of specimens of their moulded work. A. H. Grebe & Co. featured the new CR-8, described elsewhere in this issue, and the new CR-9, a single-circuit tuner somewhat similar to the CR-5.

Hammond Radio Equipment & Supply Co. featured their "Service" equipment and unit receiving apparatus. The Jewell Electrical Instrument Co. had a beautiful display of meters of every description, the most attractive to us being a uniform line for C.W. work consisting of plate ammeter, plate voltmeter, filament ammeter, filament voltmeter and antenna current thermo-ammeter, all of the same style and size. No other manufacturer in the country has a complete line like this for C.W. work. (No wonder Johnny Miller thought he could afford to get married!) Mr. C. H. Hulbert exhibited a new device known as the Transrectiformer, a stationary device that transforms and rectifies by means of an open spark gap. Joy & Kelsey displayed their entire radio line, also a receiving set built into a vertical standing cabinet similar to a telephone operator's switchboard.

Klitz Radio Mfg. Co., in addition to their line of separate pieces of equipment, had two complete transmitters, one a freak in which the rotary gap formed the primary of the oscillation transformer and the other a nifty 1 k.w. panel with synchronous gap. Karlowa Radio Co. had their products and those of the dealers they represent, and also demonstrated the Hall recording relay with printer and automatic typewriter transmitter whereby messages are received in actual print on a tape at the recorder. They also exhibited a complete tube transmitter and receiver built into a standing cabinet, ready for use. Klaus Radio Co. displayed their two-coil long-wave receiver and their line of parts, and sharing their booth was the Peoria Radio Sales Co. Liberty Radio Supply Co. of Chicago, and The Manhattan Elec. Supply Co., the latter in a big special booth, exhibited their own makes and those of the firms they repre-



Snapshots of some of the Booths.

sent. Marshall-Gerken Co. had their line of short-wave tuners and amplifiers and parts, and a low-powered phone.

Precision Equipment Co. presented a diversified line of receiving equipment of great variety, and had on exhibit the best radiophone we have seen in a long while. G. M. Proudfoot showed a line of loose-couplers and small regenerators;

Ray-Di-Co had an interesting display of motor-generators and dynamotors and a line of Turney spider-webs; the Radio Equipment & Mfg. Co., of Minneapolis, new-comers, exhibited an unusual regenerator, larger than ordinary in size and with the elements placed some inches back of the panel so that, with metal dials and verniers, capacity effects are minimized.

The Radio Corporation of America had a double booth and displayed the full line of Radiocorp C.W. apparatus. Signal Electric Co. presented their full line, and a great variety of things it covers, in both transmitting and receiving equipment. Stuart Products Corp. had an interesting line of B batteries, the fancy of many being caught by a knock-down outfit for "making your own" as needed.

Tresco had a house-full of stuff; ten-dollar tuners galore, the original "box" that started them out, a small radiophone, and, perhaps most interesting of all, a C.W. tuner very similar to that described in June QST. Telephone Maintenance Co. had a good-looking line of receiving equipment, both tuners and tube apparatus, and the whole family of Magnavoxes, for whom they are Chicago agents.

The United States Government was well represented. Ninth District Inspector L. R. Schmitt had a booth at which information was dispensed and arrangements made for license examinations which were conducted during the entire convention. The Navy, thru NAJ, exhibited a bunch of Navy radio apparatus, and the Army, thru the Signal Corps, was similarly represented. The booth of the latter formed the "boat-house" for Mr. Edw. Glavin's always interesting radio-controlled torpedo, which made periodic voyages around the hall, to the delight of the crowds.

Wilcox Laboratories showed their complete line of supplies and parts, with some novelties in the way of switches and rheos for panel mounting. Westinghouse, with the big triple booth at the head of the hall, kept open house with plenty of lounging room, and had their line of amateur apparatus and a big commercial receiver on display. Victory Radio Co. of Cleveland exhibited a series of storage B batteries that looked like the real goods.

The entire direction of the show was in the hands of Mr. N. E. Wunderlich, of the Chicago Executive Council. That he did a darned good job is self-evident, and we heartily congratulate him on the success of his end of the game.

Where the Credit Belongs

The credit for the wonderful success of the convention belongs to the Chicago Executive Radio Council, who managed every detail of it. All the members of the Council pitched in and helped, but those who were particularly active and whose good work needs mention were as follows:

R. H. G. Mathews, Central Division Manager, was the Director General of the affair, with N. C. Bos, chairman of the Executive Council, as Assistant Director General. N. E. Wunderlich was Show Director, with H. Davis assisting. Joe J. Novak, treasurer of the Council, was in

general charge of financial affairs, with E. Slicer as assistant, while Bill Schweitzer handled transportation with R. E. Brooks as his assistant. E. F. Horn had charge of the Stunt Party. Steve Wnorski presided over registration, the issuing of badges, etc., having for his assistants his sister Miss Jeanette Wnorski and G. R. Frost and W. Watts. J. Q. Adams handled the advertising of the convention, while B. W. Stolte, Council secretary, looked after the publicity, assisted in handling the radio show, and found time to keep an eye on the A.R.R.L. booth.

While there are lessons to be learned from this convention that will improve the next one, all hands are agreed that the Chicago boys put it over in thoroughbred style. We are keenly appreciative of what it meant—weeks of careful planning and months of hard work under high tension with little rest or recreation. We of the A.R.R.L., from Miami, Fla., to Vancouver, Wash., and everywhere in between are proud of you and grateful to you beyond the power of expression for the good job you did for Citizen Radio. It will stand forever!

The Chicago Executive Council handled the First A.R.R.L. National Convention under agreement with our Board of Direction whereby the Council financed the entire undertaking and were of course to be entitled to anything that might be cleared above expenses. Our enthusiasm over the brilliant success of the convention is tempered by sadness in the advice that the Council lost about \$1,500 in the undertaking. In accordance with A.R.R.L. principles it was not designed to be a money-making proposition, revenue and expenses being adjusted as closely as possible, but unforeseen expenses developed that gave a most unfortunate financial outcome.

A number of the beautiful convention badges are available as souvenirs, as advertised elsewhere in this issue, and the Council would be glad to dispose of them.

Convention Strays

R. H. G. Mathews was discovered using purple ink—indisputable proof that a convention puts one under a sort of strain.

Did you "Make a Visit to Radio Wunderlich"?

The convention badge was absolutely a thing of beauty. A pin part carrying a place for one's name suspended a medallion by a black-and-gold ribbon—the A.R.R.L.'s colors. Within the lettering of the medallion was a full-sized replica of the A.R. R.L. emblem. Class is no word for it!

L. C. ("Droopy") Young, of NSF, just recovering from typhoid, tried hard to get to the convention but was forced to stop off at his home at Ft. Wayne. Unanimous-

ly the meeting at the banquet adopted a motion to wire Young their regret at his inability to be present with wishes for his speedy recovery.

Some fellows we know won't be able to do much brass-pounding for quite a while—sore arms from too much hand-shaking.

Everyone remembers with a kindly smile the "Young Squirt" from Dallas. Here he is. Jack A. Colligan, 12 years old, born in Corsicana, Texas, but whose motto now is "It's in Dallas!" When he stepped on the stage with O.M. Bessey at the banquet, the most deafening applause of the whole meeting greeted him. As 6ZK said, they represented the youngest squeak-box and the biggest coal-burner in the outfit. Jack is in the sixth grade at school and shows exceptional faculties in both perception and study, is an excellent pianist, and fully demonstrated that he can address an audience without fear and without the need of a sheaf of notes. He has a good station in Dallas, with Amrad receiving equipment, Baldwin phones, a spark-coil transmitter, and an aerial slung between two steel masts set in concrete foundations. The Dallas gang love him (don't blame 'em) and so we're sure he will give a good account of himself.

Wouldn't it have been wonderful if the Ft. Worth police department's representative had attended the Police Broadcast Meeting at the convention?

What happened to that photograph of that Texas gang? We never got it, and it was worth looking at. Fifteen of 'em, by George, all the way from Houston to San Tone.

Did you get your pair of the Oilcloth Diaframs, highly valued as prizes for conspicuous feats? The Dakota Division gave them out as souvenirs. They are fine when QRM is bad.

It was certainly unfortunate that not enough delegates presented railroad certificates to get the reduced return fare, but it seems it was a fact. Twelve hundred present, and only 220 certificates turned in. Many came ahead of time, and many wanted to stay over, many came by auto, but probably the biggest factor was the number who were enroute to school instead of returning to their homes, so that the required number could not be found who were traveling on the certificate plan.

The QST skit at the banquet was got up hurriedly and the actors had never had a rehearsal. Since they sat at desks, however, it was perfectly easy to read their parts from the script. But typewritten C's sometimes look like O's, and so an unconscious joke was perpetrated when one

of the actors, reading a letter on the much-cussed subject of spark versus tube transmission, stated that "the spark is better than the O.W." Zowie!

Prof. Jansky suggests that Ohio should be nicknamed the C.W. State.

The Peoria lads had some good parodies on popular songs, which were sung at the banquet. The chorus for "Ain't We Got Fun" was good:

"Every morning, every evening, ain't we got fun,
Not much money, but oh honey, ain't we got fun,
The juice ain't paid for, we haven't a cent,
We put her together and away she went.
In the winter, in the summer, don't we have fun,
Static's bum and getting bummer, still we have fun,
There's nothing surer, the QRN is mighty heavy,
In the meantime in between time, ain't we got fun."

Talk about honest men. Hastings, 3ALN, came to the convention late, after the banquet started; he couldn't find any ticket-sellers so walked in, took an active part, ate heartily, hollered and sang with the rest, and after the meeting broke up got hold of Wunderlich and forced his five-spot on him.

The convention photographer was F. P. Burke, 106 No. LaSalle St., Chicago. Photographs of anything and everything connected with the meeting can be obtained from him.

At one of the meetings the initial attendance was small, everybody being at the show. This produced a comical sight when Matty, rendered desperate, placed himself gavel in hand at the head of a serpentine line that wended its way in lock step thru the show in search of members, invading booths and rapidly accumulating new participants, until, some 400 in number, it returned to Convention Hall while all the transmitting sets in the show shrieked out SOS and HI.

Heard on the boat trip:

1st op: "See the priest eating a ham sandwich!"

2d ditto: "Well, what of it? He's not a rabbi."

1st op: "No, but this is Friday."

Coroner Hoffman, addressing convention: "This is no place for the coroner—I don't see any dead ones here."

If it had not been for Bessey the Third District would have had the heaviest man present—Bidwell of Washington. At that, it can be claimed for him that he got into

the game in the reverse of the usual manner, as he started in from the mathematical end, took up receiving, and since the convention has sworn to put in a transmitter.

The Third issued at the banquet a formal invitation to the Fourth District to take part in the convention to be held at Wash-

ington on Feb. 22 and 23d next, on the ground that the 4th is in the same radio inspection district and is also geographically related to them. The invitation was accepted for the Fourth by 4XC.

Well, we had Quite
Some
Time!

Some New Apparatus at the Conventions

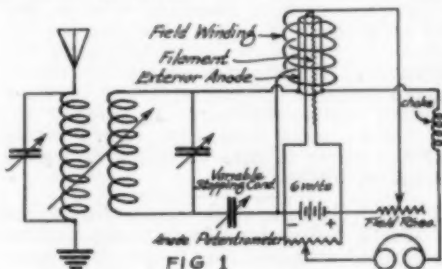
IT isn't very hard to imagine that before many years slip by we will be having radio shows every year at which the "new fall styles" in amateur apparatus will make their debut. Something of the sort was evident at the 1921 convention, several exceptionally interesting pieces of equipment having their premiere on that occasion.

The Connecticut Tube

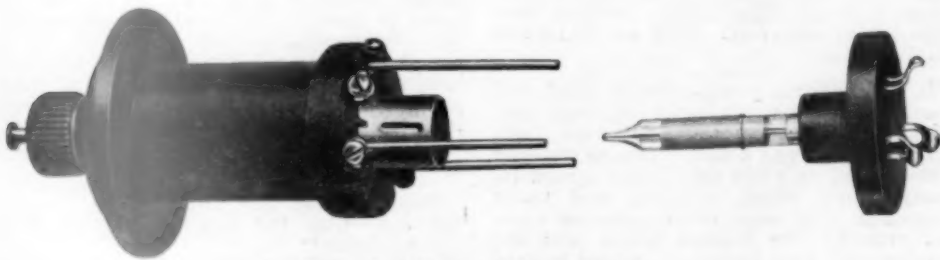
The talk of the show, we believe, was the new Connecticut detector tube. Here for once is something new under the sun; something radically different and intriguing. It has been our good fortune to be invited to the laboratory of the inventor, Mr. Harold P. Donle, chief engineer of the Connecticut Telephone & Electric Co., of Meriden, Conn., where the tube was studied in actual operation and data gathered for this description—the first information made public on a device that holds much interest for the amateur.

In introducing the subject we would call the attention of our readers to an article appearing on page 22 of QST for October, 1919, describing a Connecticut tube of earlier model. This was an elongated

best known as the manufacturers of "Connecticut" ignition systems for automobiles. They have entered the radio field slowly, but with both feet. The present tube is the result of over four years of real research, over 1600 experimental tubes having been made and a careful log kept of their performance. Mr. E. C. Wilcox,



president of the firm, estimates that about \$100,000 has been spent in its development. These points are of interest in letting us know that the tube is not the result of hit-or-miss experiments, and that it is backed by a two million-dollar firm of repute.



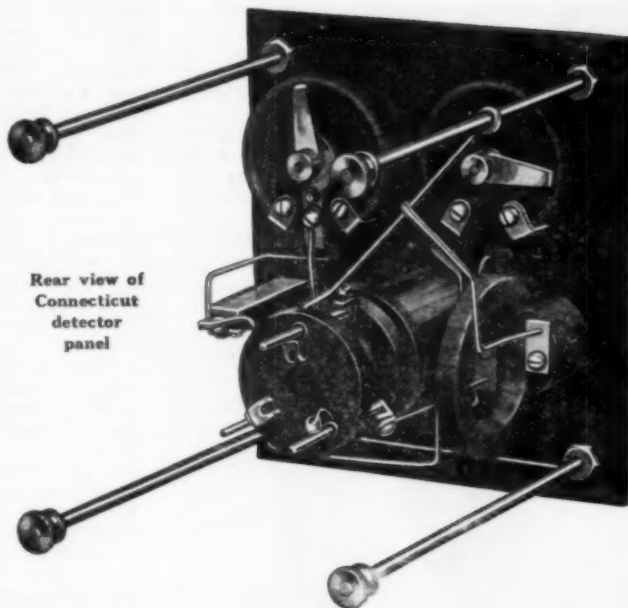
The Connecticut Tube and its Field Coil

three-element tube in which the anode was a silver plating on the outside of the glass wall, the space current freely passing thru the glass by an electrolytic action when the walls were properly warmed by the filament.

We must digress a moment to say that the Connecticut Telephone & Electric Co. is an old long-established firm, perhaps

The several illustrations herewith will give a good idea of the appearance of the tube and its appurtenances. Briefly, it is a small elongated tube containing only a filament within its exhausted interior but bearing a deposited silver anode on its outside wall, the whole placed within a magnetic field. Figure 1 shows the connections, with a simple spider-web tuning

system. There is no grid, no B battery, no tickler coil or plate loader—it is a two-element tube. In this case the magnetic field is obtained from a solenoid winding, and the position of the tube in the field is adjustable. A single 6-volt battery is used and this performs three functions: it heats the filament; it excites the field winding, controllable by a series rheostat; and it provides a plate potential, adjustable by a potentiometer across the battery. In the plate circuit are included phones and a r.f. choke. The input is connected across the anode and the negative terminal of the battery, thru a variable stopping condenser. In the photograph of the detector panel front, the upper left-hand knob is the field rheostat which is used for coarse adjustments, fine adjustments being had by moving the tube in and out of the solenoid, which movement is controlled by the large knob with dial in the lower center. The anode potentiometer is in the upper right-hand corner, and is equipped with a vernier for very fine adjustment. There is no control for the filament, it being directly connected to a 6-volt battery and operating equally satisfactorily



Rear view of
Connecticut
detector
panel



The Connecticut detector unit

whether the battery is fully charged or almost exhausted. The filament is metallic, neither coated nor tungsten, and operates at a bright red. Of course such a filament at so low a temperature would not ordin-

arily emit sufficient electrons for satisfactory action but in Mr. Donle's tube with exterior anode another factor enters in the form of electrolytic action on the warmed glass. It is probable that the sodium in the glass is ionized, a copious supply of electrons resulting, probably a hundred times what would be available for an interior anode which did not get the benefit of the chemical action in the glass.

So much for the arrangement. The performance is even more interesting, but likewise more complex. The tube will detect, regenerate, oscillate, heterodyne—and so may be used for either spark or C.W. reception. The main point about its adjustment is that *the tube must be tuned to the desired signal*. This is something we haven't heard of before—*tuning a tube*—yet it is just what takes place in this one. The adjustments are exceptionally critical but result in exceptional selectivity and a similar decrease in QRN. Increasing either the field intensity or the anode potential or drawing the tube further into the solenoid raises the frequency—reduces the wave length. It covers from 50 to 2500 meters.

It is hard to say just what is going on within the tube. It will "oscillate", or whatever it is, at any desired wave length, *entirely without any inductance-capacity connected in*, the frequency determined solely by the "tube-tuning". (The best action of course is when it is resonated with the tuning system.) It will be noted in Figure 1 that if the tuning circuit is

disconnected the only path from anode to filament is thru the phones and choke, where radio frequency current can not pass. What, then, is it that "oscillates"? Mr. Donle says that *inside the tube there is a certain phenomenon going on continually which gives a sinusoidal variation of the internal impedance.* More than that dependent saith not, and we hesitate to venture any guesses as to what the phenomenon is. Of course it is not due to a radio-frequency variation of the field intensity—a permanent magnet will do quite as well.



The Connecticut tuning unit

The exterior anode, by the way, is essential, and is different from the Fleming patent in that the latter specifies two electrodes within a vacuum whereas the Connecticut tube contains only a filament inside.

The detector action of the tube is somewhat similar to the action of a gaseous tube on one of the kinks in its characteristic curve, with the added advantage that in the Connecticut tube the location of the "kink" and its "steepness" can be regulated—it makes its own kinks. Furthermore, at a given setting of field strength, variation of anode potential gives a certain *change* of wave length, while another value of field will give a

different change for the same anode potential range.

In practical operation it is necessary to tune the tube the same as the receiving set, and this adds very much to the complexity of getting signals. Furthermore, the adjustments are very critical but smooth-running verniers make nice control easy. Mr. Donle tells us that, when once adjusted say for 225 meters, a leeway of 25 meters up or down is possible with good efficiency by merely varying the location of the tube within the solenoid, and that C.W. signals may be nicely heterodyned. We witnessed a comparison of this tube with a picked three-element detector of above average performance, hooked up to a three-circuit regenerator. On 600 meters the signals on the Connecticut tube, when once it was adjusted, were considerably louder than on the extra-good standard detector—we estimated they were 1.5 to 2.0 times as loud. The tube works with very loose coupling and this, combined with the tuning of the tube itself, results in a most pleasing selectivity and a remarkable diminution of interference from strays as well. Mr. Donle claims for it a signal 2 to 2½ times as loud as obtained from other tubes, provided the peak adjustment is secured. Tests made this same night on amateur wave lengths were unfortunately negative, it being one of New England's dead nights and no sparks could be picked up at the hour of tests on either set, so that no comparison could be made. We expect to witness tests on 200 meters in the near future and will take pleasure in announcing the results.

A GREAT diversity of receiving tuners were on exhibit at the Convention and there was something to suit anyone's pocketbook. Among the better grade of regenerative tuners there was a noticeable trend towards better construction and ease of adjustment that would facilitate C.W. reception. This tendency we might say was evidenced in three particulars which were embodied in several sets shown: vernier adjustments, shielding, and rear connections for batteries, etc.

The Grebe CR-8

Standing head and shoulders above all the other receivers was the model CR-8 of Messrs. A. H. Grebe & Co., of which we present several photographs. No one could see this tuner without marvelling at the beauty of its construction. It is a work of art. The consensus of opinion was "the best-looking set I have ever seen in my life." It is all of that. Mr. Grebe states that it has been especially brought out for the critical demands of A.R.R.L. relay work.

The circuit used, shown in Figure 2, presents no deviation from the original

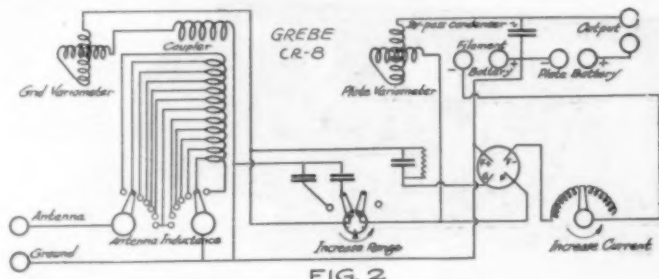
CR-3 circuit except in the method used to obtain three wave length ranges. A wave-change switch, mounted to the left of the rheostat wheel, places additional capacity in the circuits in the following manner: the first position (150-375 meters) provides for tuning by inductance variation only; in the second position (280-650 meters) the switch causes a small condenser to be shunted across the grid cir-

The accurate line-up of shafts and bearings has made possible the use of a highly satisfactory type of vernier—a rubber-tired wheel which operates thru a slot in the panel upon the reverse face of the dial. This vernier is always "in gear" but the friction is so slight that it does not interfere with the movement of the dial itself.

Back of the panel in front of each variometer and the coupler is a grounded aluminum plate, which gives effective shielding from body-capacity effects. No bearing contacts are used in any of the rotors, positive connection being made by the use of pig-tail connections instead, which certainly is an improvement on the "clicking" of loose connections.

The detector equipment has been included as an integral part of this instrument in the endeavor to approach a set that shall have a constant wave-length calibration—something that is impossible when the detector is separate since there is no standardizing the length of leads that will be used in connecting up, etc. Grid condenser and leak, by-pass condenser, socket, and a calibrated rheostat are therefore built in the set, with battery connections made from the rear thru holes in the back of the cabinet. The only terminals on the front panel, then, are the input and output connections.

The variometer verniers, the rotary



cuit; while in the third position (600-1000 meters) this condenser is shunted across the plate circuit and a second and slightly larger condenser is put across the grid circuit. The bottom view of the receiver gives a clear idea of this switching arrangement.

The variometers are perhaps the most interesting and attractive feature of the sets. They are moulded, from "natural" colored bakelite, and each consists of a frame, two cages, and a rotor, the latter made of identical interlocking halves. Owing to the great strength of the material it is possible to reduce the volume of the dielectric surrounding the windings, and



Front view of the Grebe CR-8

this is particularly noticeable in the "cages" which support the stator windings. The word "cage" describes them very accurately, for it is not a case of pouring composition around the stator windings; instead, the windings are formed and fitted into the cages, then clamped to the supporting frame. The rotor has been moulded with very thin walls, and all terminals are brought to the rear of the completed variometer thru an insulated sleeve within the hollow rear shaft.

selector-switch, and the rheostat are all made up in the form of horizontally-mounted wheels, projecting thru slots in the panel, as will be evident in the photographs, and all controls are unmistakably lettered. The usual Grebe tapered-grip dials, hinged-cover cabinet, etc., are used, and the three views herewith can do the rest of the talking.

Designed to be the embodiment in one unit of many suggestions made by practical

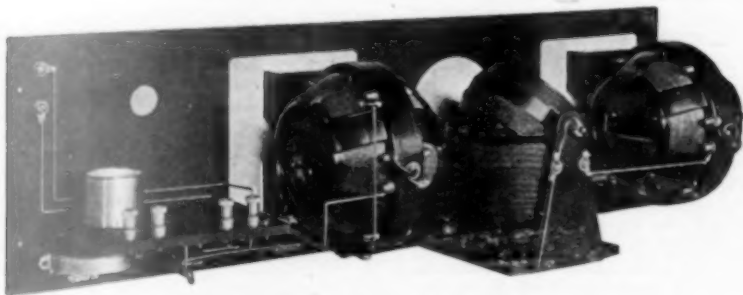
amateurs, this set is a thing of beauty. Up to this writing we haven't had our fingers on one and so cannot speak authoritatively concerning its actual performance—but we have no doubt it lives up to the usual Grebe reputation.

The Paragon Telephone

The Adams-Morgan Co. gave the first

left-hand knob is an 8-point rheostat, while next to it is a switch for changing from telephone to either I.C.W. or straight C.W. Terminals are provided for antenna and ground, A and B batteries, microphone and key, while a buzzer is mounted in the center of the panel.

A new modulation scheme is used, details of which are not yet obtainable, but



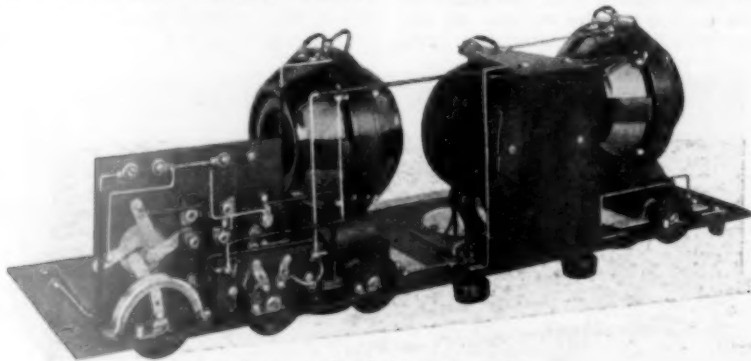
Behind the scenes in the CR-8

exhibition of their new type 2-5-U radio-telephone, a set designed by P. F. Godley to obviate the trouble the average amateur has in applying somebody's "reliable dope" to his own problem where different antenna resistances and capacities or different plate supplies may make it unsuccessful—which is always expensive and discouraging. The 2-5-U is so designed as to perform satisfactorily on any antenna capacity from .00025 to .002 mfd. and of resistances up to 50 ohms, with any plate voltage from 80

speech from this set has been pronounced "perfect". Using two UV-202's with 350 volts on the plates, this set puts 1.25 amps. in a 7.5 ohm antenna, and has worked telephone 15 miles daylight using one such tube and only 100 volts of B battery for plate supply.

The Amrad Regenerator

Another receiver that held the eye was the new tuner of the American Radio & Research Corp., of which we present a



Bottom view of interior of CR-8

to 500. It uses one or two tubes, up to 5 watts power each. The scheme of the oscillatory circuit is shown in Fig. 5 and will be recognized as the C.W. circuit now so much in favor. Referring to the view of the panel, the knob in the upper right controls the grid-coil coupling, and the two switches below it control the plate coupling and wave length by taps on the main inductance. Seven wavelengths between 160 and 325 meters are thus provided. The

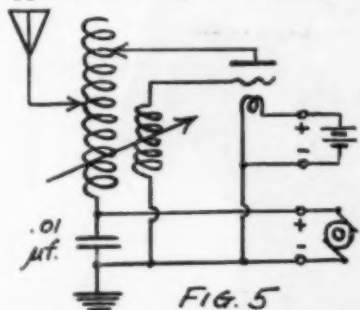
front and an interior view. The cabinet is mahogany, polished like glass, with rounded corners, and with the gloss-black dials and white lettering made a most pleasing appearance. And in this set again we find shielding, verniers, back connections, and sub-mounting permitting the quick withdrawal of the assembly from the cabinet.

The variometers catch our fancy. If there is anything in the minimization of

distributed capacity and excessive solid dielectric in the field of the windings, this set ought to produce exceptional results, for there is certainly no surplus material in any of the forms holding the windings. They are built up with a basket-weave type of winding, on the same style as spider-webs, on light forms cut from thin fibre, made in two halves and each "rib" securely fastened to its neighbor on the opposite half by a tiny rivet. Shellac,

Division at Portland, Me., on Sept. 10th, the Amrad company publicly exhibited for the first time two absolutely new devices which promise to solve the problem of d.c. supply for C.W. work at a reasonable cost. A rectifier known as the "S" tube, operating on a new principle, and an electrolytic condenser recently perfected, were there shown and are described below.

The rectifier or "S" tube, named after its inventor Mr. C. G. Smith, is shown in



Oscillatory Circuit - 2-S-U Fone

wood, bakelite, etc., are eliminated, and the low limit in distributed capacity would seem to be realized by this and the coupled fact of the "wavy-wound winding".

The verniers are a new wrinkle. Instead of being mechanical, operating the main variable factor, they are themselves tiny variometers, of wire wound on little bobbins, and have a range approximately equivalent to two divisions on either variometer dial.

The panel is only 15 by 5 inches and the wave length range 170 to 360 meters. Two pairs of binding posts make provision for the reception of longer wave lengths by the connection of two adjustable loading coils (one of which shows in the photograph) and fixed condensers.



figure 3. A is cathode and B is anode. When a tube is conducting freely the tube insulates a potential in the reverse direction. It will be noticed that the cathode consists of a hollow chamber with a hole C opposite the anode. The anode is a plain cup. The electrodes are placed relatively close together and the tube is filled with helium at a pressure of about one centimeter. If there were no hole in the cathode the tube would insulate voltages in either direction up to a few thousand volts. With the hole, however, the discharge passes through into the interior of the cathode. The theory of operation is briefly as follows:

Electrons leaving the interior of the



The new Amrad regenerator

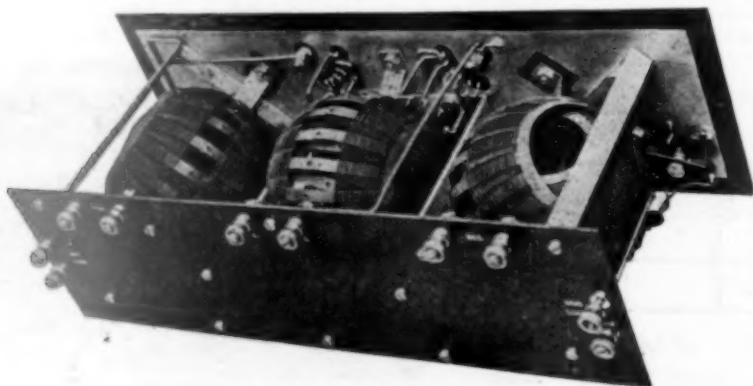
New Apparatus at Portland

THE Chicago Convention is not the only A.R.R.L. Convention that can boast of first-showing of new apparatus this fall, for at the annual convention of the Northern Section of our New England

cathode travel a relatively long distance in getting out through the hole to the anode and produce positive ions along their journey and thereby maintain gaseous conduction. When it is attempted to drive current the wrong way any electron

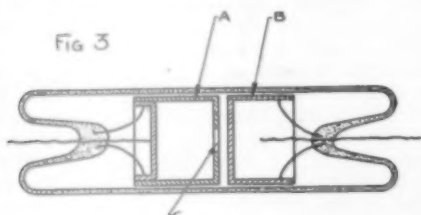
leaving the electrode that has no hole in it will arrive at the other electrode after a very short journey because they are pulled over near to the edge of the hole before they have an opportunity to go through. Electrons which travel a short distance produce few if any positive ions

Col. R. D. Mershon, embodies an exceedingly large capacity in a very small space. Briefly it consists of an aluminum electrode or anode immersed in a boracic acid solution. A very thin film of oxide on the anode formed by electrolytic action serves as the dielectric of the condenser, con-

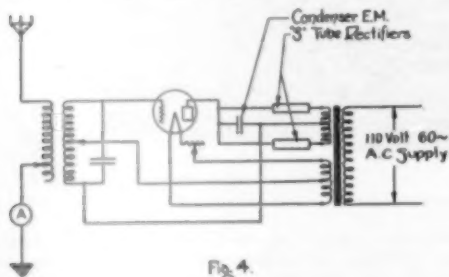


Interior of the Amrad tuner

and gaseous conduction is not maintained. We thus have a tube which conducts freely in one direction and insulates for potentials applied in the opposite direction. The



voltage drop in the tube while conducting is of the order of 150 volts. In the opposite direction it will insulate over 5000 volts. The disintegration of the electrodes in operation is almost nothing when proper materials are used, thus insuring a long



life. With proper cooling $\frac{1}{2}$ ampere may be passed through the tubes.

The condenser, which is the invention of

section being made to the electrolyte by means of a nickle rod which constitutes the other terminal. The accompanying photograph will give perhaps a clearer idea of the size and construction of the condenser, which is only three inches in diameter and three inches high. A capacity of 38 micro-farads is obtained in this small space by constructing the anode in such a manner that a large surface is exposed to the electrolyte.

The condensers will stand voltages up to 500 without puncturing and are self healing if broken down by excess potential.



The Amrad Smoothing Condenser

Two condensers may be connected in series to withstand 1000 volts, three for 1500 volts, etc. Care must be taken that the aluminum anode be connected to the positive side of the rectified a.c. or the condenser will not function. In eliminating the a.c. hum or ripple the condenser acts as a smoothing capacity and because of its size does not necessitate the use of chokes such as used in filter circuits

employing smaller capacities. This in itself is a considerable saving as the cost of the condenser hardly equals that of the chokes alone.

Condensers of this type having capacities of several thousand microfarads are now being used commercially for the correction of power factor on inductive loads, thus showing that they have been fully in-

vestigated and developed.

Figure 4 shows both rectifiers and condenser connected to a V.T. oscillator utilizing 60 cycle a.c. with a transformer for both filament and plate supply. A modulator tube may be added for radio telephone use and of course the oscillator circuit may be modified for various types of feedback.

Godley to England to Copy Transatlantics

THE Traffic Manager came before our Board of Direction at its meeting at Chicago during the Convention and after announcing the plans for the second series of Transatlantic Tests this winter, proposed that the A.R.R.L. send a qualified American amateur overseas to listen for our stations on American apparatus, to supplement the efforts of the British amateurs. The Board thought the idea was a great one

would go to England under the direction of our Operating Department and has accepted the invitation. He sails on the Aquitania on November 15th!

Now doesn't that warm up your sporting blood? Talk about Transcons—we're having Transatlantics now, and WE'RE GOING TO GET OVER!! We have implicit faith in the ability of the British amateurs and in their equipment but the sending of Mr. Godley will instill even



and that money so spent couldn't be put to better use in furthering this good old game of ours, and they voted to do it. The next question was who to send. Everybody was agreed that it ought to be the very best practical receiving man in the country, so that we would never feel that there was a better man we might have sent. It was agreed that Paul F. Godley, originator of the three-circuit tuner as far as amateur work is concerned, was the logical man; that in the opinion of the Board Mr. Godley was America's best authority and best operator in short wave receiving. Mr. Godley was asked if he

more confidence in us American and Canadian amateurs, will be both an inspiration and an urge to greater effort on the part of the British, and will enable the A.R.R.L. to make these tests a free-for-all in which everybody can participate. As originally planned they were to be confined to the more powerful stations who complied with certain preliminary requirements, this being necessary because the British are not such "Boiled Owls" as we North American hams and do not, as a class, relish staying up to all hours, and it was at first thought that the transmitting schedules would have to be limited. But

the sending of an American amateur changes this so that not only will the special stations have individual schedules but everybody else can enter who will. We want everybody to join in this and have some fun. Now is the best chance you will ever have to hang up a real distance record. Don't get the idea that the fellows on the Atlantic Coast are the only ones who have a chance. Inspect a globe and you will learn some mighty interesting things. The general direction of the British Isles from points in this country is *northeast*. Remember that signals travel along the arc of the great circle passing thru the points of origin and reception.

times for each district, all Canada being considered as one district because of the relatively small number of stations there. It will be noted that the schedule is "rotated" every night so that if one hour is better for transmission than another, every district will have an even chance. As to wave length there is no stipulation—stay where you are if that is desirable, but bear in mind that if you want to increase your chances a hundredfold, get on 200 meters where the British will be listening. We don't know much about the equipment Mr. Godley will take over but we have it from him that it will be sufficiently flexible to cover the usual amateur

TRANSATLANTIC SCHEDULES BY DISTRICTS

For the Free-For-All Periods

Transmitting Period	Wed. 7th	Thur. 8th	Fri. 9th	Sat. 10th	Sun. 11th	Mon. 12th	Tues. 13th	Wed. 14th	Thur. 15th	Fri. 16th
7:00-7:15	1	2	3	4	5	6	7	8	9	C
7:15-7:30	2	3	4	5	6	7	8	9	C	1
7:30-7:45	3	4	5	6	7	8	9	C	1	2
7:45-8:00	4	5	6	7	8	9	C	1	2	3
8:00-8:15	5	6	7	8	9	C	1	2	3	4
8:15-8:30	6	7	8	9	C	1	2	3	4	5
8:30-8:45	7	8	9	C	1	2	3	4	5	6
8:45-9:00	8	9	C	1	2	3	4	5	6	7
9:00-9:15	9	C	1	2	3	4	5	6	7	8
9:15-9:30	C	1	2	3	4	5	6	7	8	9

Time periods are in Eastern Standard Time. Dates are in December, 1921. Numerals indicate radio inspection districts, the letter "C" standing for all Canadians, who for the purposes of these tests are grouped as one district.

Stretch a string along the shortest path between England and your location. You will see that signals from New England pass over the maritime provinces of Canada, while those from points west of Denver travel across Hudson Bay. The most remarkable thing is that the distance to England from the northwestern states does not seem to be over six or seven hundred miles farther than from our south Atlantic states, and Mr. Godley expresses the belief that because of better refraction and reflection inland stations have fully as good a chance of getting over as north Atlantic coast stations.

Here is the transmitting scheme: For six hours each night for ten successive nights, December 7th to 16th, inclusive, watch will be kept on the other side. Each six-hour schedule will be divided into two parts, the first one running from 7 p.m. Eastern Standard Time to 9:30 p.m., and the second from 9:30 p.m. to 1:00 a.m. The first section each night will be devoted to ten periods of 15 minutes each, and in each period all the amateurs of an inspection district that care to are invited to call England and sign. Instructions on procedure will be given in our next issue. The schedule appearing herewith gives the

tunes, including "specials", from 150 to 425 meters. No registration is necessary to transmit in this period; simply open up and observe the schedule for your district. (The listening-hour schedules are suspended during these tests.) If you will imagine yourself a listener on the other side during these periods you will realize that this schedule will make conditions much as if our regular relay work were going on—a flock of stations in operation, some of which are going to come bumping thru and be copied. If you want to be one of them, climb in with us and follow the schedule. Sixth district stations especially invited! And, you spark men!—this is not a C.W. contest; you're wanted, and if you can show up the C.W., more power to you!

Now in the second section of the nightly schedule, from 9:30 to 1:00 a.m., individual schedules will be given to stations who qualify in the preliminary tests (1000 miles overland between Nov. 1st and 6th) as explained in September QST. Applications for this section will be accepted up to Oct. 12th. This 3½-hour section for the ten nights will be evenly divided among the qualifying stations, and cipher combinations assigned them to transmit. Schedules will be furnished them, and again the

transmitting periods of each station will be "rotated". Such stations are also invited to participate in the free-for-all period of their respective districts, as well.

Outside of our office the only copy of the matter to be transmitted will be in the hands of Mr. Philip R. Coursey, British 2JK, of London, who is in charge of reception arrangements in England. We are asking Mr. Coursey to arrange for witnesses to sit in with Mr. Godley to verify all reception, and records made on any of the special-schedule stations transmitting cipher combinations will be subject to verification by Mr. Coursey after check-



Paul Forman Godley

ing with his copy. All Mr. Godley will have will be a schedule of hours and wave lengths—the same as the other listeners there.

A few words concerning the man we are sending overseas to represent us will be of interest. Paul Forman Godley, member of the A.R.R.L., I.R.E., R.C.A., and of our A.R.R.L. Advisory Technical Committee, was born at Garden City, Kansas, Sept. 25, 1889. He migrated eastward thru Missouri, Iowa, Illinois, Indiana, and finally at college age found himself in Ohio and very much interested in communication methods. He attended Defiance College at Defiance, Ohio, for five years, summers and an occasional odd term being devoted to telephone and telegraph work with railroads and commercial companies as line-man, operator, wire chief and train dispatcher. During this period he displayed

great enthusiasm for radio but the available literature on the subject was not abundant ("Scientific American" articles and the E.I. catalog) and it was not until 1908 that the first specimen of a commercial wireless station was encountered, in Chicago. Mr. G. promptly attached himself to this outfit and began getting experience as a wireless operator and installation man. Early in the summer of 1909 he was placed in charge of the Grand Rapids station of the United Wireless Telegraph Co. and in the fall of that year concluded an agreement with Dodge's Institute of Telegraphy at Valparaiso, Ind., whereby a 1½ k.w. spark set was installed at that place and a course in wireless instituted under Mr. Godley's direction. The year of 1910 was spent in study at the University of Illinois, while the fall of 1911 found him directing installation of equipment and outlining a course of instruction for the Collegiate Institute at Port Arthur, Texas. During the greater part of 1912 the Postal company availed themselves of his services as wire chief at their main New York Office, while early 1913 found him on the Amazon River in connection with the institution of an "Amazon-to-the-Andes" radio service for the Brazilian government, and his experiences during this period were of great variety and value. He returned to the States in the summer of 1914 and began study and research work at his home in Leonia, N. J., where the short wave regenerative receiver with which all American amateurs are now familiar was developed. Station 2ZE was put into operation the following spring and captured all distance records, and traffic was handled with great consistency in daylight work from Albany to Leonia to Baltimore and Philadelphia.

The first real information of value to amateurs regarding the great possibilities of the audion was contained in his paper, "Applications of the Audion", which was read before the Radio Club of America, New York City, during the winter of 1915-16 and published in QST the following fall. We mean to say that Mr. Godley is the man who took the Armstrong circuits, theretofore considered impracticable for short-wave work, and adapted them to amateur work. The credit is his for making possible present day amateur reception, and he gave us amateurs our first short-wave regenerative receiver. In 1915 he became a member of the firm of Adams-Morgan Co., Upper Montclair, N. J., and fathered the development of "Paragon" radio apparatus. During the late war and subsequently he served as designing engineer at the Marconi factory at Aldene, N. J., in charge of receiver design, and apparatus which he developed during this period for Army and Navy use brought considerable credit to him, his Signal Corps

considerable credit to him, his Signal Corps receiving equipment being the only American-built apparatus mentioned in the report of the Chief Signal Officer to the Secretary of War. He has but recently completed important radio survey work for the Independent Wireless Telegraph Co. and is again to be found in Montclair with his own company which is making several worthy additions to the list of amateur radio equipment.

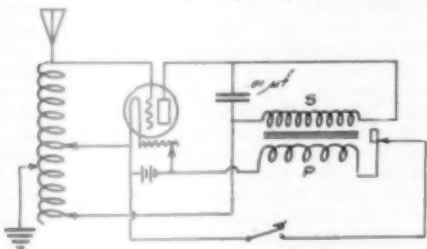
In October, 1918, Mr. Godley married Miss Elizabeth Harper Harold of Montclair, N. J., and we have just congratulated him upon the arrival of a second child, Paul Forman Godley, Jr.

To work, then, men! The A.R.R.L. is calling to every American and Canadian amateur to do his part to make these tests a success. We need help in two ways: first, listen for the stations in the preliminary tests, 7 p.m. to 3 a.m., Nov. 1st to 6th, and report everything heard for verification of their range; second, get in on the transmitting, per schedule. We want enough power radiated so that "Paragon Paul" will hear us. He is relying on us to do our part and we need not worry about him—he will do his part.

Spark Coil C.W.

3 JJ, Washington, D. C., has a simple little C.W. set supplied by a one-inch spark coil, the circuit, being shown in the annexed diagram.

The inductance is an old home-made three-slide tuner wound with No. 22 bare wire. The condenser across the coil secondary is of copper-mica construction and about .01 mfd. capacity, enough load



to bring the voltage down far enough to prevent endangering the tube. A Western Electric "E" tube is used, and all the power is supplied by one 6-volt battery. Difficulty is experienced in getting enough current thru the coil secondary—it should be specially wound for lower voltage and higher current.

With a total input including filament of 20 watts, this set has worked 3HG in Baltimore, 40 miles. Considerable experimenting has been done with various vibrator frequencies and it was discovered that

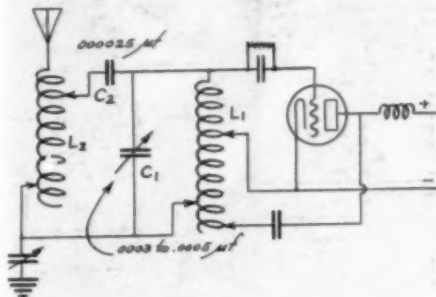
while, locally, a 500-cycle tone was just as strong as lower frequencies, a 60-cycle supply heterodyned more pleasingly and carried better at a distance. To get this low tone a chunk of solder is fastened to the end of the vibrator. No antenna current can be detected with the present set, the energy is so small, but the set can be tested for oscillations by listening on the receiving set. When oscillating it produces a smooth hum similar to a non-rectified C.W. set, but when not oscillating it has a rough scratchy sound.

Locally in Washington the spark-coil alone is fifty times as loud, but the C.W. carries many times as far.

Preventing C.W. Swinging

A NEW wrinkle, or rather a new application of an old idea, appears in the constant-frequency circuit recommended by the Radio Corporation in their new handbook on C.W.

It is well known that C.W. signals will swing violently when the transmitting an-



tenna is rocked in a hard wind, and heretofore the so-called "master oscillator" has been the only solution proposed. This scheme utilizes a low-powered tube, connected in a local circuit with concentrated inductances and capacities, as a generator of oscillations of the proper frequency, the power tubes then being used merely as power amplifiers, the output voltage of the master oscillator being applied to their input.

As an alternative, and saving the expense of additional tubes, etc., the circuit shown herewith is proposed. Any oscillating circuit may be used but in the one illustrated L_1 normally would be the antenna inductance, with antenna and ground connected to it. Now, however, it is shunted by an adjustable condenser C_1 , variable in steps to simulate the capacity of the antenna, adjustment being made as with a phantom antenna. Then across

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EDITORIALS

de AMERICAN RADIO RELAY LEAGUE



Our First National Convention

AS this belated QST reaches our membership, our first great A.R.R.L. National Convention will have passed into history. It truly was all we expected of it, and more. It marked the high point of Amateur Radio on this earth. Not only were there present members from every one of the nine radio districts, but in addition there were many of our Canadian cousins present. For the first time in history the entire United States and Canada was represented in a radio meeting. We confess we were profoundly impressed, as we gazed into the faces of those who had come from great distances and realized the effort they had made and the expense they had incurred in getting there. And all for the sake of our beloved Radio. Back in 1916 one of the visions we sometimes conjured up was a great meeting when all nine districts might get together. We little imagined at that time that in five short years we would see this dream come true in Chicago. But it came true, and it makes us wonder as to the magnitude of those things the good old A.R.R.L. will be doing five years hence, in 1926.

One of the impressive things which got beneath our skin at Chicago was the presence at our Show of several of the largest corporations in the world. No less than three of these had booths, and had their agents present to talk to us. They would not have been there had they not believed that we were worth it. Another very impressive thing was the action of Mr. Herbert Hoover, Secretary of Commerce, in sending Chief Radio Inspector Terrell from Washington to the Convention to express to us the good will of the Department and to offer its good services in any way that might be needed for the advancement of Amateur Radio in the United States. Still another thing that was present, and which cast its warm glow about, was the fine old A.R.R.L. Spirit. In most national conventions of various kinds of associations there is present the influence of selfish ambition. One section of the country seeks some advantage over some other section of the country, and jealousies and pulling apart result. We are thankful that we of the A.R.R.L. are the kind which exclude these things. At our convention

there was but one motive behind every fellow's action, and that was to do his bit in helping to advance Amateur Radio as a whole. And, fellows, this is why we are growing and progressing so fast and so vigorously. We are loyal to one another, we recognize the basic principles of good government and we are pulling together. As we grow big, we are somehow able to maintain that atmosphere of personal intimacy and friendship that is usually only present in small groups of people. Let's stick to this line, fellows, and go on and on.

The work of the Chicago Executive Council was tremendous. The action of our Board of Direction, when it instructed our President to express the official thanks of the National Organization to the Chicago Executive Council for what it had done to make this greatest of all radio conventions a success, was something that must make every one of us feel glad. It was a great occasion and Amateur Radio will be the better for it for many a year to come.

By Way of Explanation

THIS is a queer issue of QST. Altho we believe it will have as much of interest and information as usual, it's different. Our usually crowded table of contents shows only three main articles and still the departments are shaved down to a fraction of their normal content, in spite of the fact that this issue of QST has more pages than any of its predecessors. And we're late as the very devil, so that The Old Man's question may be asked with all propriety: "Say, son, when are you going to get QST out on time?"

The answer, of course, is the Convention. Copy for this issue of QST normally would be almost entirely prepared on a date that found all of us still in Chicago at the big affair with not a word written. And written it had to be, for the country wants to know what the convention was like and this is the issue it had to go into. We believe our readers will agree that this number was worth waiting for. Much space has been given the Convention story not alone because a permanent record must be made of it as a duty to amateur history but because it is genuinely interesting. Altho there are but three main articles in

this issue they will be found to embrace almost all of the subjects we try to cover each month; there is good "dope" on both spark and C.W.; descriptions of new apparatus; the usual amount of good fun; news on what our fellows are doing with themselves; and, tied up intimately with the Convention story, the announcement of the sending overseas of a U.S. ham to listen for our Transatlantic Tests. All of the departments have been clipped this month with the exception of "Calls Heard", but we did our dooty there, (eh, men?) and present seven big pages of 'em, fitly ushering in the fall season (if we're permitted any longer to speak of "seasons" in amateur work.)

Next month we hope to be practically on time and we have a number of valuable articles ready for presentation, among which are "Some Operating Notes on the Larger Sizes of Transmitting Tubes", by W. C. White of the General Electric laboratories; "The Protection of Nearby Wiring against Troubles caused by Spark Transmitters", being a resume of the recommendations of our A.R.R.L. Advisory Technical Committee on this important subject; "The Design of Loop Antennae", by David S. Brown; "Increasing the Tuning Range of Regenerators", a practical article by McMurdo Silver; and the third prize article in our recent contest on "spark" articles, "Improving the Relay Spark Transmitter", by Sumner B. Young. We have a world of good material ready for our readers this fall and it will be presented as liberally and as promptly as our facilities permit.

Good Weather

OUR A.R.R.L. is now entering its eighth winter as a national organization of amateurs. Summer strays have disappeared, the golden harvest time is here, and every night sees better air for relay work. Better as far as atmospheric conditions are concerned, but better for actual operating? We doubt it. The air is positively crowded now. There are far and away more stations than ever before and the serious effort that lately has been made to operate on legal wave lengths, together with the renewed activity attendant upon the coming of cooler weather, has already produced interference problems greater than we ever knew before. "Calls Heard" testify that signals still manage to break thru the din and are recognized at ever-increasing distances but we all know that the expansion in amateur activity has brought about changed conditions that will make such feats increasingly rarer. Closer stations generally are louder than distant ones, and now that there are so many in regular operation it is almost impossible to handle traffic in the early evening in those great big jumps across several states that we used to make.

We amateurs have a hard problem indeed. Every one of us has the same right to the air that the other has but there are thousands and thousands of us, some expert and some beginning, some thoughtful and some careless, but all trying to use "the same air" at about the same wave length. Only the nicest possible handling of this situation will prevent aggravations that will make decent work next to impossible and A.R.R.L. men ought to feel that it is their duty, as representatives of our forward-looking organization, to use the superior knowledge which is theirs by long experience in an effort to improve conditions in their territories, wherever they be located. The following things need to be done:

Message relaying, to be reliable, has to come to the short-jump system. More use must be made of the waves under 200 meters, where QRM is very small at present. Decrement has got to be looked after even more carefully than wave length. Plans for the division of operating hours, like the Chicago Plan, are becoming essential for congested communities. The time has come to start the Listening Hour schedules, as announced in August QST, so that we may have the fun of knowing how far we can send and receive, and we should follow them and urge our neighbors to do the same.

It's high time to get the old set in the pink of condition for the winter's work, OM. The DX weather is already here, the manufacturers have now presented us with all the new apparatus they have prepared during the summer—the time is at hand. In many ways this will be the most remarkable season we United States and Canadian amateurs have ever enjoyed. Let us get the utmost out of it.

And remember, fellows, that in mentioning QST when you write our advertisers you help your A.R.R.L. and will make possible a steadily-improving QST which shall contain more and more of what we want.

PREVENTING C.W. SWINGING

(Concluded from page 32)

this combination the antenna circuit with another similar inductance L_2 is connected, coupling being via the high-voltage condenser C_2 , having a fixed capacity of 25 mmfds.

The coupling co-efficient being practically constant, the wave length of the oscillator is determined by L_1C_1 , a combination which is not subject to swinging in the wind, etc. The antenna circuit of course has its maximum current when adjusted to resonance but changes in its constants effect only its current—not its frequency; the frequency stays that of the driving circuit L_1C_1 .

It should be understood that there is no magnetic coupling between L_1 and L_2 ; and that the condensers must be capable of standing the voltages encountered.

The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.



THIS question was asked me: "How much of our traffic is handled by CW?" It was estimated that perhaps 25 to 40 percent of it went by CW. In order to get a definite count of messages handled by spark and by CW, it is requested that all stations make every effort to show the number of messages handled by each method of transmission.

No definite date was set for the commencement of the observance of the "QUIET HOURS" as per schedule shown in August QST. Fellows, we must have some new DX records, so let us all go into this QUIET HOUR schedule whole heartedly—let us start strict observance upon receipt of this number of QST. We are starting the good radio season right now and wonderful records will be made. A slight change is necessary in sections B and C. Windsor, Canada, should be in section B. Upon investigation we found that there are more stations in Windsor than we had thought, and being right in the vicinity of Detroit this change of boundary is necessary.

New rules and regulations of the Operating Department will appear in an early issue of QST, also in small book form. These rules and regulations have to do with better operating in handling relay traffic.

All of you will miss the little cartoons in this issue, but because of the limited time cartoons could not be made.

ATLANTIC DIVISION

C. H. Stewart, Mgr.

Southern N. J., M. Frye, D.S.—It has been noted that there is very little activity in this section due to the fact that many stations' operators are away on their vacations.

Long Island, H. Collins, D. S.—Consistent work is being carried on with New England states and cities south to Savannah. Messages to northern New York and Chicago are cleared occasionally. Stations doing this good work are 2ZL, 2AJW, 2OE, 2CY, 2WM, 2ZV and 2JU. 2ZL, 2AJW, and 2ZV are CW while others mentioned stick to the spark. 2AJW handled 72 msgs. while 2EL has 74 to his credit and 2JU 45.

Brooklyn, N. Y., F. A. Maher, D. S.—2ARY, 2RM, 2DO, 2WB, and 2PF are all on the job doing their best to clear traffic with the following number of messages handled: 2ARY-159, 2WB-20, and 2RM-17. 2TS will take the place of 2CS.

Western N. Y., Benzee Bros., D.S.—146 messages have been reported for this district. 8AWP leads with 56 to his credit. City Manager Young reports no traffic for Elmira due to heavy QRN. City Manager Woodworth reports three good CW transmitters in Syracuse. No reports from Niagara Falls, Lockport, or Jamestown.

New York City, E. A. Cyriax, D.S.—398 messages were handled in this section which must be considered good in view of the fact that QRN was extremely heavy. 2XK with his CW topped the list with 464, 2DI-189, 2ACT-63, 2BCF-17, 2BNL-5 and 2TC-1. 2DI, 2XK and 2CT have been clearing traffic to and from 1st, 3rd, and 8th district stations. 2XK and 2ACT have a regular schedule with 4GL and 8DE on CW.

Northern N. J., F. B. Ostman, D.S.—This was a banner month for this section with 535 messages to our credit. We have a bunch of operators who still think that the spark is THE transmitter and still have to be shown otherwise, basing their contention on the number of messages handled by sparks as compared with CW as shown below. Sparks: 2BG-148, 2OM-97, 2UK-30, 2AXB-30, 2ARB-41, 2SQ-19, 2OX-10. CW: 2BBN-28, 2RU-26, 2GC-17, 2RR-8, 2ANZ-6. Probably if some one will explain why four times as many messages were handled by spark as by CW when QRN is at its worst, CW having a reputation for cutting thru it, 2BG and his gang will be converted. 2UK, 2AWL, 2AXB, 2BG, 2OX and 2RU deserve much credit for their excellent work in handling traffic. An all-CW route is being formed from the Metropolitan District to Phila. and shore points. CW stations wishing appointments please communicate with the D.S. at once. 2UE and 2AWL are also handling traffic for Phila. and the west.

Hudson Valley, C. E. Trube, D.S.—Traffic is moving regularly except to the north, where relaying is at low ebb. 2BK, 2DA, and 2BM are back and will keep traffic moving to the north when they get under way again. This will complete our

Hudson River Route to Albany. 2UA is handling the bulk of the traffic, assisted by 2DJ, 2DN, 2BFZ, and 2HJ. Messages handled as follows: 2DJ-60, 2DN-125, 2BFZ-104, 2HJ-3, 2BK-7, 2UA-110, total 399. On his first night our 2BK cleared messages to seven districts. 2OA is back on the job after much effort to quit the game.

Capitol District, F. H. Myers, D.S.—There has been but little activity in this district due to QRN and because the Hudson River Route has not been open. Traffic could not get to New York City except on rare occasions. 2AWF is doing the bulk of the relaying but no report as to the number of messages handled has been received. No reports received from Schenectady or other cities.

District of Columbia, F. M. Baer, D.S.—3ZY has 160 messages to his credit for the month. The bulk of this was handled with 2XK and 4GL. 3KM and 3XF have combined their interests and will keep continuous watch at 3XF. 3IW is back with CW. Little activity in Baltimore—3OU reports only 15 messages. No other reports have been received as regards traffic. QSS tests were conducted between Baltimore and Hagerstown, and Baltimore and Washington. The reports were turned over to Mr. Kruse for investigation. 3EM has been overhauling his station. 3APT has turned to CW. 3AJD, 3CT, 3ER and 3TN, have been favoring the gang with concerts.

WEST GULF DIVISION Frank M. Corlett Div. Mgr.

Again I want to impress upon the various Traffic officers the importance of making their monthly reports regularly and on time. Reports are missing from Oklahoma Section and New Mexico Section.

The Division Manager is compiling a complete map and card system showing every city and town in the division that has an A.R.R.L. station. In order to have the map and records correct it was necessary to mail to each member in the division a blank card to be filled out and returned to the Division Manager. The members have been rather slow in returning the cards and of course this delays the completion of the map. Will each member please forward his card to me at once. If you have only a receiving set forward the card so stating, if no set at all fill out the card to that effect and return it; that is exactly the information that we want.

NORTH TEXAS SECTION

John Dorsa, D.S., has assumed several business obligations which necessitates his resigning the office of Dist. Supt. of the Northeast District. We regret very much that we must lose John in this capacity because he proved to be such a good worker.

Ben Emerson, City Manager of Dallas, sends in his resignation and at the same time is selling his entire radio set prior to quitting the game. This came as a surprise to us and nearly wrecked our morale. We lay a safe wager that Ben will be back in the game before the coming season is over.

Mr. Guy Neel, Dist. Supt. Central Texas, comments on the way the stations in his district have stuck to their posts through the heavy static and pushed traffic through to the extent of 233 messages. 5XJ leads with a total of 61, with 5ZAF, 5IR, 5AO, 5NS, 5RP, and 5KS trying hard for the top. Mr. Neel has just finished a trip over his territory and has succeeded in getting three stations started in Clifton, Texas, which will help our short route to Waco. Waco and Granbury were also visited and everything found to be going strong, with 5ZAF leading at Waco and 5NS leading at Granbury. Two C.W. sets are under construction in Granbury and two spark stations will be in shape soon to help 5NS out. No report from Eastland, Texas—get busy boys. Brownwood is open again with a new DX set. The Dublin stations are getting ready for the season with two steel towers a hundred feet high and a ground two hundred feet in circumference.

5RP of Clarette, Texas, is due credit for handling traffic one hundred miles in daytime with two Ford spark coils.

J. L. Martin, Supt. of Western Texas District, requests that all stations in his territory, whether licensed or not, report giving him a line-up on their sets so that the coming season can be entered with unlimited pep.

Asst. Div. Mgr. Heafer of North Texas hopes that a permanent line-up can be obtained by the end of the month in order that his part of the state may be kept as far in the front as possible with traffic reports. Mr. Burt Gamble has been appointed City Manager of Dallas, succeeding Mr. Emerson, but no appointment has yet been made for the vacancy left by Mr. Dorsa as Supt. of the Eastern District.

SOUTHERN TEXAS

Dist. Supt. Tilley reports his assistant for the Austin Territory, Frank Rives, 5BO, is now out of the game, having dismantled and sold his equipment. There are several new stations springing up in Austin but 5ZU and 5ZAG are handling the bulk of the traffic—all daylight work, however, as QRN still makes work at night impossible. There is a surprising amount of daylight work going on now between points as far as 100 miles apart, some of the sets being 5 and 10 watt C.W. 5ZAG, 50 msgs.; 5ZU, 75; 5YK reports 14. 5XB, College Station, still silent but will open next month.

A. P. Daniel, Asst. Dist. Supt. reports

for the Houston Territory that about the only DX work is that being done by 5HZ, in the early morning hours after daylight. He has installed a one step, and can consistently work San Antonio, Austin, and Elgin, Texas. 5FA has improved his station lately and is now in daily communication with 5HZ. Total messages handled by 5HZ-20.

5ZE who formerly was reported QSA as far northeast as New York city on his Grebe sink gap, has been operating off and on all summer on an Amrad. He will open up with the new season, using only the Grebe sink gap. His mast is being raised to 110 feet.

5ZT has arranged to have three operators at his station all season. Roberts, the owner of the station, will use the personal sine of—GP. He is now constructing a slender ladder-like mast after the plan of 5ZU, about 100 feet high.

5JM, 5HE, 5DH, and 5EU are now in training at the Citizens Military Training Camp at Camp Travis, and will return shortly to their stations.

Peine, 5AE, has at last got a mast. He has been most unfortunate as regards masts, having lost every one that he has ever attempted to put up. The present main mast is a young telephone pole 60 feet high, which will be capped with a twenty foot tin addition.

Asst. District Supt. Daniel recently made a tour of the southwest part of the state in the interest of radio; and was accompanied on the trip by Roberts, 5ZT, president of the Houston club, and Peine, 5AE, vice-president. The log of the trip showed a distance of 690 miles covered in the three days.

Schulenberg—Fine masts, but station out of commission, and not likely to operate this season.

San Antonio—Best station, 5XI. A wealth of equipment, and two first class operators, Lt. Burgess and Sgt. Trost. Uses fan for transmitting, and single wire for receiving. Installing high power CW and fone. Operates on 240 and 425, the latter wave reported steady by all DX. Houston QRK. 5ZAE, owned by Mr. Wall, treasurer of the local club, is a well equipped station and a dependable one. The set was apart when visited, as many new features were being worked out. He QRKs Houston stations. 5ZR, owned by John Rodriguez, and operated by himself and two other very capable men, is well located. The set was apparently side-tracked for the time being, as Mr. R. is busily engaged in establishing a radio business in the large room adjoining the operating room. The receiving set was a temporary affair and the transmitter was badly in need of adjustment. All San Antonio stations are badly QRMed by WUJ.

New Braunfels—Only station, 5YK, located at high school building, and altho found disassembled, will no doubt be satisfactorily adjusted for good work when the new season opens. A transmitting panel was under construction. Mr. Sahm, chief operator, is principal of the school, and a very agreeable person to know. He is thoroughly interested in the work, and besides, conducts a class in radio. This week he is visiting among the Houston hams. Houston QRK, including QST at 7 P.M. daily, no QSS on 375.

San Marcos—Paul Stevens' station, 5MG was visited, and found to have a dandy antenna. Receiving set in working order, but using home made honeycombs at present. Rotary out of order. Operator has experimental license.

Austin—5ZU busy putting up a fine ladder-type mast 100 feet high. Has remote control transmitter using Benwood sink gap. Uses Grebe CR2 receiver and Grebe two steps and loud speaker with fine results. Daddy Tilley is a dyed-in-the-wool bug. 5ZAG has a dandy little shack of comfortable proportions and which houses a very complete station. His radio-fone is a marked success, and is entirely home-made. His antenna is ruined by a large sycamore tree which grows immediately under the center of it and is drained as the lead-in passes it. This station is now owned entirely by George Endress. The University station promises to be THE station of Austin, and will be in charge of Mr. Tilley and Mr. Endress. The masts are perfect, and the antenna system is all that one could desire. No money has been spared to make this set the leading one in the vicinity. 5BO and 5EJ not in operation, and operators out of city.

Elgin—5KP is the spark station that is doing the work at this little town. Has a large spare room upstairs in his residence which is all his own. The panel is entirely too big. On it is mounted everything known to the radio art. Hi. It is of oak, and stands about 6 feet high. Uses a Franklin oil cooled transformer, which looks good. Open rotary gap. 5KV is a CW set operated by Finlay Carter, who is home for the summer. He is a student at Rice Institute at Houston, and intends to install the set in his room at Rice. Has been able to work 5XJ and 5HZ on two Radiotrons.

This office has been assisting in the organizing of a live little radio club at Laredo, Texas, Mr. Chas. Clark, a long time commercial op., being president. All members are being lined up as A.R.R.L. members.

This office has also just finished the preliminary installation of a 1 K.W. set at Cuero, Texas, and will be handled by Mr. Fulk, a long time Western Union man, and will prove to be a good relay station, west.

This station, 5RA, has been testing daily with 5ZX and 5HZ during daylight hours.

DELTA DIVISION

J. M. Clayton, Mgr.

Activity has increased considerably with the approach of fall and the end of the QRN season. Several stations are now in operation and taking advantage of the good nights that put in an appearance now and then. Other stations are very near completion and three weeks more ought to find practically every DX station in the Division ready for business.

Mr. W. L. Kennon, D.S. of Mississippi, reports promising conditions prevailing throughout his territory. He feels sure that stations at New Albany and Shelby will be in full running order by October 1st. 5YE, University of Mississippi, will soon open up with an entirely new equipment.

5ER and 5FV of Nashville, Tenn., have been in operation off and on all summer. They both have managed to get some traffic thru all summer. Lately fifteen messages were handled in three working nights. Good work for this climate.

5XQ, P. E. Lehde of New Orleans, is one of the newly erected stations in that city. 5XQ will blossom forth with spark, fone and C.W. Mr. Lehde is a new-comer in the amateur relay biz but with his knowledge of radio and his wide experience he should have no trouble keeping pace with the old timers in the game.

5ZP, the Assistant Division Manager, is still on the sick list—taking life easy down at Bay St. Louis, Miss. ZP thinks he will be back at Nola and running the station in fine shape by the middle of September. The Division Manager wants to take this opportunity of commending Mr. deBen for the hearty co-operation he has always given in all League matters. Ever since ZP was Official Relay Station for New Orleans over two years ago, till the present time, the Division Manager has never had to do more than request information from deBen before a reply comes back post-haste. ZP has been sick and out of the game entirely for the past four or five months, and a lot of the time he has been flat on his back in bed. Still the reports come in from him on time and his trusty mill continues to "bat 'em out" to all the Division personnel. We only wish the Division was chuck full of deBen's!

5ZAC when last heard from was preparing to leave for a trip to New York. We have received no word from him in several weeks so we presume he has carried out his threat and lost himself in Coney Island. ZAC reported that his station was complete and lacked only an aerial to render it operative.

5EK, Memphis, is doing some nice work

and handling some traffic, altho we haven't received a report from him yet.

5JD, Kinsolving at Little Rock, has a new shack and is in working order.

No report received from the Pullens at Houma, La.

No report received from the following District Superintendents:

W. L. Barrow, Louisiana,

W. C. Hutcheson, Tennessee.

There are numerous appointments for Trunk Lines and Official Relay Stations open in all the states in the Division. All interested parties should get in touch with the Division Manager immediately.

NEW ENGLAND DIVISION

G. R. Entwistle, Mgr.

Vacation fever seems to have set in when it comes to writing reports. Too much rebuilding of apparatus and planning for conventions takes the mind from reports. Asst. Div. Mgr. Robinson, 1CK, reports for his section as follows: 1LZ reports that Chelmsford is still on the map and intending to put in C.W. very soon. 1ZE still handling traffic between static, QRM and vacation. 1BDT has just put up a new 90 foot pole and has installed a new 1 K.W. "stone-crusher". 1CZ, not to be outdone, has also put in a whole K.W. and is going to erect some new poles and antennae. When these two get going the city of Quincy will need a new generator at the power house. 1XE is still sending out the police reports and everyone is getting so used to the OW's pleasant "hello" that she seems like a personal friend of us all. 1RX has handled 62 messages during the last month and can clear traffic for Maine at any time of day and is just aching for traffic going that way. 1FB, 1BDV, 1BDC, 1ARY and 1ACO are all coming through quite regularly and with good audibility, although 1BDC invariably swings out just at the time when traffic is going his way from Boston. 1CK has put up a new steel tower with a wooden top mast, a new aerial consisting of 4 four-wire cages arranged like a regular inverted L aerial, with a new counterpoise. He is giving radiophone concerts nearly every night at 8 p.m. 1DH and 1ES are doing good work with small C.W. sets. A number of fellows are working "break-in" systems with their C.W. sets by using two aerials at as near right angles as possible.

Asst. Div. Mgr. Castner reports great results from the convention. Station 1DU has been remodeled and reopened and will be operated by E. S. Rogers and H. W. Castner. A 1 K.W. spark set and 20-watt tube set will be used and a regular schedule established. 1ARY holds a regular daylight schedule with Canadian 2CI. 1FB at Prouts Neck, Maine, has been success-

fully working DX with his 1 K.W. coffin and synchronous gap and has succeeded in working one 4 station. 1GBI at Augusta has been reported QSA in New York State and at the same time QRZ in Maine. 1FV is about to install a QST-made "sink" gap. Station 1AHK at Lisbon Falls is on almost every night with 2 5-watt tubes and is very QSA in Portland with both voice and C.W. 1UL and 1ACO at Bath are right on the job and are very active in keeping the interest up and all traffic cleared in that direction. 1BLS at Auburn is getting a four 5-watt tube set together and will dispense a bunch of jazz music later in the month. 1BJS at Damariscotta Mills, Maine, reports that he is still on the job and has always done some very good DX work. 1BKP at Berlin, N. H., Y.M.C.A., is in charge of G. C. Barney. Brother Barney, 1BK, 1EK, 1BDI and several others of our real birds will all return to University of Maine in the Fall, and as all will be upper classmen it is to be hoped that they will be able to get the faculty to do something in radio at the college.

A.D.M. Mix reports his territory is still on the map, although reports from D.S.'s are lacking.

ONTARIO DIVISION

A. H. K. Russell, Mgr.

A reconstruction of this division has taken place during this month, with a new sub-division of the province into 7 districts, as shown in enclosed attached sketch. District 1 is under W. J. Carter, 3DH of Windsor; 2 controlled by Gowan, 3DS in Kitchener; 3 controlled by Russell in Toronto with 3GE as assistant; 4 by Rogers in Newmarket, 3BP; 5 by Donnelly, 3HE in Kingston, and 6 by Major Steel in Ottawa; the 7th District is not yet organized. All these district managers have been asked to appoint city and county managers in an endeavor to get our division reports fuller and of more interest. Unfortunately, this is as yet of no avail as three of the six active districts have not sent in reports this month.

Caton, former district manager in Napanee, has moved to Ottawa to join the Divisional Signallers and hopes to be of help to the A.R.R.L. in that city. Kingston and district have shown some activity and hope in the winter to become a real relay point. Owing to spark interference with government station in Kingston, C.W. looks to be the one best bet in Kingston City with spark sets in Belleville for further assistance. Mr. Orton Donnelly, President of Kingston Radio Club, has taken over Mr. Caton's job as District Manager in the district and hopes to have things humming soon.

District No. 2 reports having lost a num-

ber of good relay stations by the reconstruction and Gowan says he will have to start right in and build up an efficient district with the promising new material at hand. 3QJ in St. Jerome's College, Kitchener, which is being operated a good bit by Gowan, is doing excellent work and has handled 12 messages this month. Ingersoll stations are showing up well and Mackay in Ingersoll will be of great help between Windsor and Kitchener.

District 3 will be back in relay work immediately. 3FO, 3GE, 9AL, 9AW, 3CO and others are all expecting to open up with increased power and distance in the



immediate future, and the D.M. hopes to prevail on several phone stations to let us hear from them on C.W. occasionally, in the hope that their sigs will reach out more. 3CS in Toronto is going to open up with a 50 watt tube and generator on a new aerial, and it is hoped 3CZ will also get into the game, and also 3OW, 3LI, St. Catharines and 3KS Niagara Falls. Station 9AL ran tests with 2BF in Montreal during the month, in which the latter's I.C.W. sigs were heard in Toronto well, and so the Montreal-Toronto route looks like being realized at last. 9AL also managed to work 4GL twice during August, as well as other DX stations.

ST. LAWRENCE DIVISION

A. J. Lorimer, Mgr.

This section of the country remains rather quiet with very few stations in operation.

Vacation season and QRN are mainly responsible.

1AZX at Burlington is temporarily out of operation waiting for some new tubes. 8BKR at Potsdam, N. Y. is now coming thru fine with his 5 watt C.W. set.

We expect to have at least four High Power C.W. outfits here this coming season which will enable us to handle most DX direct.

The tubes available here are especially convenient for shifting from spark to I.C.W., the regular spark transformers and condensers being suitable for I.C.W.

work with our tubes of anything over 250 watt size.

No reports received from the Levis District—we are wondering what has become of all our northern stations.

Mr. Rogers of 9AK, Charlottetown, P.E.I., is planning a relay route thru to Montreal. This route will have to cross northern Maine and we especially request Maine amateurs to help us in bringing this route thru. The route will probably reach Houlton, Me., from St. John, N. B., Moncton, N. B., serving as relay to Charlottetown, P.E.I., if the jumps can be covered under the conditions.

ROCKY MOUNTAIN DIVISION

M. S. Andelin, Mgr.

The season of static hit this division about as hard as any place that I know of. Early in the spring the stations began to drop out one by one until at the present time there are only a few in operation. Stations could very easily be worked thru-out the summer if it were not for the static. Many DX stations can be heard but it is impossible to read them thru the noise. This is true in every part of the division. Some traffic has been handled but nearly all has been just short-distance relays and transcon. traffic has been practically nil.

Mr. Reynolds, Supt. for Colorado, reports the following: You have no doubt read of the various floods that occurred in Colorado in the past month. Several communities were cut off without any communication possible. This worked a hardship on the people. We are trying to get the amateurs of Colorado better organized so that such floods or storms will not isolate communities in the future as they have done before.

When Pueblo was cut off from the outside we went down to Colorado Springs and tried to reach Pueblo by radiophone, but we couldn't get anybody there. We then tried to take our portable radiophone to Pueblo but the authorities would not let anyone out of Colorado Springs onto the Pueblo road. If we had only had someone there with a station connected with the A.R.R.L. it would have made radio history as the wire connections were out for two or three days.

We are putting up two 80 foot towers and building a 100 watt C.W. set that will soon be in commission. There are several other mighty good stations that will certainly put Denver on the Radio map.

Mr. Garner, Supt. for Utah, reports several stations are under construction and others are being repaired in northern Utah and the new trunk line thru there, going north and south, looks fine. Some excellent results were obtained in tests with Vashon, Washington, 7IY, this spring and the re-

sults this winter should be much better.

Mr. Ira Kaar (6ZA), Asst. Div. Mgr., is in Idaho working for the Forest Service installing radio telephones but will be back again this winter with a C.W. set to increase his range.

Mr. Thompson (6ZH), one of our old reliable stations at Richfield, has left for parts unknown and will not be in the air with his familiar spark this winter.

This division has so many new stations starting up in the Rocky Mountains that the proposed north and south trunk line will be a big success. This line will relieve the traffic congestion from either the south or the north transcon. traffic routes.

Mr. Glen Garner, 2348 Monroe Ave., Ogden, Utah, is now Superintendent for all of Utah instead of northern Utah and Wyoming.

Mr. Norman R. Hood, 1022 Ash St., Casper, Wyoming, is appointed Superintendent for Wyoming. Every amateur in Wyoming please get in touch with him and give him your support.

NORTHWESTERN DIVISION

R. T. Galyean, Acting Mgr.

In the Northwestern Division the past month has been one of RE's, in that re-organization and re-opening have predominated. We greet both with pleasure.

While still incomplete, re-organization is still under way and the new routine is beginning to move smoothly. By the appointment of more Dist. Supts., reports are more prompt in reaching the Div. Mgr. and his Assistants, making the reports from ten days to two weeks "fresher" than under the old system. Much credit is due H. E. Cutting, 7LY of Bozeman, Mont., Assistant Div. Mgr. Watch his reports this operating season.

Re-opening, while not complete, is also well under way, and with the letting up in QRN the signals from the outside districts are once more beginning to break thru.

In the eastern section of the Division, E. L. Wharton, 7EX, Dist. Supt. at Glasgow, Montana, has erected a new antenna, and while real LD is still impossible, a regular DAY-LIGHT schedule is maintained with Jordan and Miles City. He warns all stations that he has installed a brand new wrist oiler and will sure pound the brass this winter.

L. L. Stanley, 7DJ, Dist. Supt. at Helena, reports that a number of C.W. sets are being installed in that city and cards are beginning to roll in (How does a card "roll in"), Stanley receiving a card from Cambridge City, Pa., reporting his sigs. QSA on C.W. At Billings, Mont., Dist. Supt. West, 7XD, has installed a "coffin", and has worked 7ZO, but regular communication is held up by intense QRN. W. E. Slauson, 7ZG of Bear Creek, Mont., after

some improvements to his set will be ready for operation soon. The Assistant D.M., Cutting, 7LY, at Bozeman, Mont., has installed a regenerative receiving set with three steps of amplification, and with it stations in the 5th, 6th, 7th, 8th and 9th districts have been logged in the few nights that the set has been in operation. A 20 watt C.W. set is nearing completion which will be used in place of the spark set this winter. Altogether, the outlook in the eastern section of the Division is very favorable, and with the QRN slowing up the message curve will take a sudden upward trend and keep on climbing.

There is no report from Boise, Idaho, this month, as the Dist. Supt. E. O. Selby, operator at the Boise High School station 7YA, has gone to Berkeley, Cal., to attend the University. A new Supt. for that district will be appointed soon.

7ZS (ex 7BQ) at Pullman, Wash., reports handling some traffic, but on account of QRN eastern business goes very slowly. 7ZM (ex 7CC) of Moscow, Idaho, has also rebuilt, and is located on a high hill; but as there is a 120 ft. high metal tank within 300 feet of his antenna he is wondering just what the effect of it will be. (What is in the tank, Woodward?) 7NL of Spokane is reaching out, being heard in Portland, and with 7ZS and 7ZM in this section of the Division, call stations should have little trouble in clearing business for the east.

In Seattle, 7AY, 7IU, 7IY and 7BK have been handling most of the relay work during the past month, most of the traffic being relayed thru the Portland stations. Practically nothing has been moving east, while the sixth district stations are not easily worked at this time of the year. The local QRM situation in Seattle has greatly improved since the Totem Radio Club has taken the matter in hand. Work with distant stations is greatly handicapped, though, by DX QRM. As the number of DX stations is increasing daily, it looks as though joining that Society of Boiled Owls is the only solution.

7NN, 7NW and 7KJ, all of Hoquiam, Wash., are heard in Seattle with a fair degree of regularity, 7KJ being reported in Portland QSA. It is noted that when the Portland stations are QRZ in Seattle these stations are received well and when the Portland stations are in these stations are QRZ. This may be the solution to that day-light route between Portland and Seattle. To the north of Seattle the situation remains unchanged except that a new station at Stanwood, Washington, has been assigned the call 7CC, formerly assigned to Jack Woodward, of Moscow, Idaho.

At Eugene, Ore., 7HN and 7MF have installed 10 watt C.W. sets. "Ham" Lewis, 7OZ, has arrived in town from Portland

and has installed a $\frac{1}{2}$ K.W. spark and is installing a 10 watt C.W.

On the Coast QRN has been very bad for the past month. Seaside has been especially dull in radio work this summer. You can't blame 'em—if all DX men lived at Seaside, which is Oregon's most popular bathing beach, there would be very little radio traffic moved—there's a reason.

At Marshfield, Ore., conditions are almost as bad, in radio. The D.M. does not know if there is a bathing beach there or not. 7CN reports all northern stations QRZ with 7ZJ the only station heard with any degree of regularity. 7CN and 7IW in Marshfield are both QSA in Portland.

The most active stations in Portland during the month were 7ED, 7DP, 7LW, 7ZB (ex 7DS), on spark, and 7XF on C.W., all of which did some very fine work in clearing traffic thru intense QRN. All local stations report static letting up to a marked degree in the last week or ten days, and the eastern stations are beginning to be heard. This is good news as the route to the east has been practically tied up for the last six or eight weeks. Traffic to the south of Portland has been cleared thru 6AID, 6OC, 6TV, 6ALE (Wonder if 6ALE has a kick?—Chorus of Portland stations: "We'll say 6ALE has a kick.")

7ZT (ex 7DA has been one of those RE-building the past month—notice that new call 7ZT, of which he is very proud.

Ralph Willison, 7BP, who has been operating a cannery station in the wilds of Alaska this summer, has returned to Portland, and his steady fist may be heard almost any night now.

Charles L. Austin, 7XF, City Manager, A.R.R.L., has been elected Traffic Manager of the Northwestern Radio Association, Portland, together with three assistants: 7ED, 7ZT and 7ZB, which comprise the Traffic Committee of the N. R. A. In order to facilitate the handling of all traffic, the Committee has promulgated the following schedule:

Portland police report will be cleared between 9:30 and 9:45 P.M.

Promptly at 9:45 P.M. the Traffic Manager, or one of his assistants, will ask for reports from long distance stations in Portland and vicinity. Any stations having business will signify number of messages north, south and east. They will then QRX until 10 P.M., at which time traffic will be open for the northern stations. As soon as one station clears his business he will QSX next station having business for the north, or sign off "CLR". The next man having business for the north will proceed in the same manner, etc. Northern traffic will be limited to 10:45 P.M. at which time traffic will be open for the south in the same manner as to the north. Traffic to the south will be limited to 11:30 P.M. No northern traffic shall

be handled during this time. At 11:30 P.M. traffic will be open for the east in the same manner as to the north and south and no traffic shall be handled to the north or south during the time traffic is open to the east. Promptly upon completion of traffic in each direction, Traffic Manager will come in and say "all clr north", south, or east, as it may be. As soon as all traffic is clear to the east all stations will be free to make tests, "chew the fat", etc., but no traffic shall be handled. This schedule takes effect Saturday, Sept. 3, 1921. Your co-operation is requested.

Considerable trouble has been experienced by operators in this Division by the failure of so many to transmit the place of origin and date of every message. This is very important, as if the message cannot be delivered there is no way of knowing who to SVC for it.

392 reported messages. Busiest station, 7KB, 120 msg.

ROANOKE DIVISION

W. T. Gravely, Mgr.

There isn't much traffic news to report for the Division this month, as only a few of the old busy centers have been active. However, there is hardly a station which isn't undergoing changes of some character. In many cases, spark equipment is being greatly improved, and in others, the spark is being discarded for tubes, while in others, preparations are being made for the operation of both C.W. and spark. There has been a marked increase in tube sets.

The little "bottles" are taking the day; they weep, they grunt, they steam, they purr, they mourn, they whistle, they sing, they perform lots of stunts, but the way they handle traffic for the amateur is remarkable. Neither static nor QRM figure to any great extent, as a rule, and therefore traffic has been carried on with comparative ease all during the heated term. Southern stations have been carrying on without a stop, which heretofore with the old sparks was almost an impossibility, due to the extremely heavy atmospheric. The southern route therefore has been open all summer, thanks to 4GL at Savannah, who is in touch with 3BZ for Virginia points, and with numerous other northern, western and southern stations for traffic in the various centers.

One of the most important items of interest this month is the opening of the Seaboard route through 4AE of Newbern and 4BE, Wilmington, both in North Carolina. These two stations have recently come to the front and are being very widely reported. They are making tests at this writing so as to work up the coast line short-jump route down into Fla., and to other southern points. There are

other stations developing at the above mentioned points but the Manager is not sufficiently informed as to whether any of them are actually doing any DX work. Information is lacking for a report of conditions in and around Charlotte and Asheville, but the Manager has been informed of two or three stations in Asheville which will soon be in operation. If any of the gentlemen in either of these localities are actually doing any DX, the Manager will be very glad to be apprised of the fact. The District cannot be properly reported without information, although the Manager does keep his ears open for every station in the Division and marks it down when any of them sift through for the first time.

No report from the Central Virginia District this month, and we are absolutely without any information concerning their activities. We understand, however, that Richmond will be on the map this season with several good stations.

Meagre reports from West Virginia to the effect that activities are limited principally to construction, with 8SP busiest station, 68 messages; and 8EF and 8JE back on the job with 17 messages each. Important new station reported at Morgantown, details of which will be forthcoming at a later day. Where is 8ZW?

Will every DX station in W. Va., and those capable of it, please get in immediate touch with the District Supt., A. G. Heck, Mannington, and advise him just what may be expected in the way of co-operation? This should be attended to immediately.

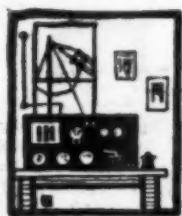
The Virginia stations have been unusually quiet for the past month. 3BZ has been in continuous operation all summer, and has been clearing with tube set. 3AEV had to abandon his old ground system because of inefficiency and has now erected a four wire counterpoise, and making other changes.

There is now much activity in radio at Chatham, a town about 20 miles from Danville, and the prediction is that it won't be very long before there are several DX stations at this point.

Much activity in and around Roanoke and Salem of the S/W Va. District. 3CA is pushing the "bottles" with might and main, but says they are dry. 3APA is working hard to have his plant in shape at an early date, 3HL is expected to be heard from, and 3AV is going to hold up his end or "bust".

Groves, our Technical Advisor, at Brooke, Va., is still doing fine work in reception and in designing receiving sets, but he needs some way to get out with signals. He has no power with which to operate, and if someone will write him how best to operate a tube set with batteries as a source of power, he will very much appreciate

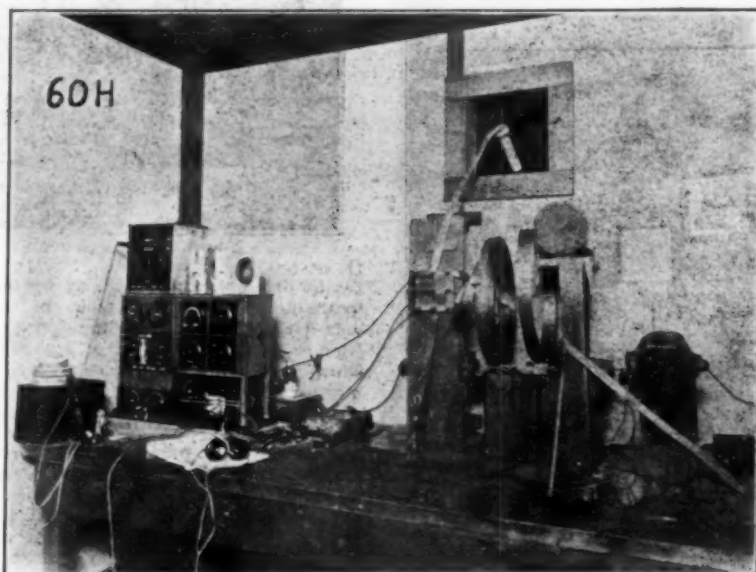
(Concluded on page 52)



Amateur Radio Stations



60H, Ukiah, Calif.



60H, James B. Mannon, A.R.R.L. District Supt. for Northwestern California, is an interesting station. It first came to our notice when 60H was reported as copying any number of DX stations and we got to wondering who this 60H-chap was. Now we all know.

From middle December to the first of March last the following stations were copied, all over 1500 miles: 5YH, 5ZA, 5ZC, 5ZU, 7ZG, 9AEG, 9AO, 9KM, 9KV, 9WI, 9LR, 9OE. The receiver is a modest one, with a short-wave regenerator using home-made cardboard tube variometers. A navy type loose-coupler is used for medium waves, and for long waves home-made honeycombs. The same tube equipment is used on all tuners—an old style Audiotron detector and a home-made two-step using Moorhead tubes.

The aerial is a 4-wire T, wires spaced 3 ft., 50 ft. high and 70 ft. long. The vertical wires are bunched 15 ft. from the

ground and a 1-inch copper ribbon runs from there to the set. The ground is a composite one—water pipes, buried plates, and buried fence wire.

The transmitter might be more neatly assembled but certain things about it excite our admiration. The O.T. is mounted directly over the condenser, and the gap at the top of the O.T. primary, the latter being a single turn of wide ribbon cut at both top and bottom to introduce into circuit the gap and condenser, respectively. The transformer is a modified Jefferson; the condenser home-made, oil-immersed glass plates in series-parallel, capacity slightly more than .01 mfd.; the rotary, home-made, spark-thru type, ten studs, running 3500 r.p.m. The operating wave length is 185 meters, with an antenna current of 3.5 amperes. 60H has been reported by commercial operators in Alaska, by 5ZA, and by 9WI.

3CS, Trenton, N.J.

Radio 3CS is operated jointly by E. G. Raser ("RA") and L. J. Kneeshaw ("LJ"). The station is located in a low river valley and hence has been badly handicapped in DX work, altho its signals have been reported QSA in the Fifth District and in the Gulf. After they finally got their antenna up to 60 ft. it was still only as high as "Mr. Jones' cellar three blocks up the hill"—and that is rather discouraging.

The station is interesting none the less and other amateurs can get some helpful ideas from it. The transmitter is a panel, in a separated lower compartment behind



which are located the pieces of apparatus making up the low-frequency circuits—a $\frac{1}{2}$ k.w. Packard transformer, h.f. chokes, variable power switch, reactance, line protectors, etc. The apparatus constituting the oscillatory system is compactly arranged behind the upper part of the panel and consists of Dubilier condensers, a 16-stud non-synchronous rotary running 1750 r.p.m., thermo-couple antenna ammeter, and pancake O.T. with 1-inch copper ribbon. An antenna switch of peculiar and original design is seen mounted just to the left of the panel.

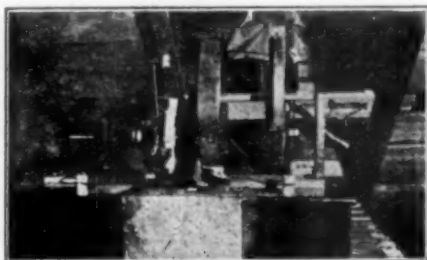
The receiver consists of a short wave regenerator, 175 to 600 meters, a detector cabinet and a two-stage amplifier, all constructed by Mr. Raser, and two pairs of Baldwin phones. 3CS expects to put in a C.W. set soon but is still a strong advocate

of the good old spark with its snappy crash and steady purr.

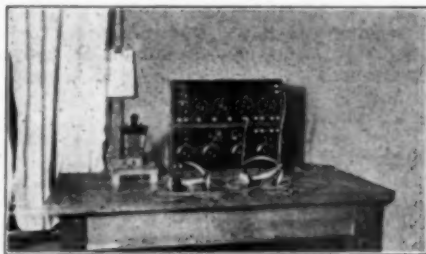
9ZL, Manitowoc, Wis.

We are afraid these photographs of 9ZL will show up none too well but this station deserves mention in QST. It was located at Manitowoc and operated jointly by Wisconsin District Superintendent H. J. Burhop ("HG") and his wife, ("NZ").

The antenna at 9ZL was an inverted L of four No. 6 stranded phosphor-bronze wires spaced 5 ft., length 71 ft., height 62



ft. at one end and 50 ft. at the other. The transmitter, which seems to have been located in the attic, consisted of a 40,000-volt United Wireless 2 k.w. "coffin" transformer, oil-immersed plate glass and sheet copper condenser, Hyrad 8-stud disc mounted on an 1800-r.p.m. synchronous motor, and a pancake O.T. with 2-inch ribbon on the primary and 1-inch on the secondary. Measured with a Kolster decrementer and Weston thermo-couple ammeter, the antenna current was 6 amps. on 250 meters with decrement exactly 0.2, and 4.4 amps. with the decrement at .13 where the station was generally operated because of its location but a mile from NTY.



The receiver is a home-made short wave tuner which Burhop claims will skin the variometer sets, and a tube cabinet containing detector and three steps of audio amplification.

9ZL was reported QSA in every district, and in turn has copied every district. Its signals have been heard by ships off
(Concluded on page 52)

Calls Heard



HEARD DURING AUGUST Unless Otherwise Specified

Amateurs reporting lists are requested to see instructions appearing at the head of this department in previous issues, and to observe the following additional instructions:

(4) In order to distinguish between spark and C.W. stations, list **spark** stations from 1 to 9 in the usual manner, and then make a second paragraph in identical form listing the **C.W. stations**.

HEARD AT SEA

On board KDDI, S. J. Mallery, Opr. Aug. 16, 1000 miles east N. Y. C., 1HO, 1HW, 2EL, 2EQ, 2ZV, 3CC, 8KE, Aug. 17, 740 miles east N. Y. C., 1ZE, 2ARY, 2EL, 2UF, 3AH, 3EW, 3HJ, 4GL, 8AHU, 9ZN, 2AX Canadian.

Can. 3DE, Toronto, Ont.

Can. 3BP, 3DS, U. S. 1CAK, 1DR, 2AJW, 2DN, 2ARY, 2AWL, 2QN, 2ARB, 2EL, 2AUU, 3IW, 3CC, 3BZ, 3AQR, 4EA, 4GL, 8AVI, 8YU, 8CH, 8NQ, 8XM, 8OL, 8AXC, 8IU, 8QY, 8DE, 8AYN, 8AGK, 8PC, 8MM, 8ZZ, 8WY, 8ZJ, 8OM, 8HA, 8TT, 8OW, 8AHH, 8WP, 8JM, 8HJ, 8IL, 8AFT, 8DR, 9AH, 9MC, 9UK, 9AZX, 9ZJ.

Can. 2BF, Montreal, July-August

C.W.: 1CAK, 1CF, 1SN, (1TS), 2ADL, 2AWL, 2AJF, 2BBN, 2BFZ, 2DN, 2FS, 2GR, 2KL, 2RR, 2RU, 2XK, 3BZ, 3VY, 3ZY, 4GL, 8AIO, 8AQF, 8BCL, 8BT, 8DE, 8JB, 8IL, 8IV, 8LF, 8LX, 8NQ, 8QY, 8WY, 8XM, 8ZD, 9ZN.

SPK: 1ZE, 2ARY, 2EL, 8ACF, 8AGK, 8AHH, 8AWP, 8AV, 8SP, Can. 3BP.

IES, Brookline, Mass.

C.W.—1ABY, 1AGI, (1AJP), 1AYK, 1AZJ, 1BCN, 1BES, (1BWK), 1CAK, 1CCZ, (1QN), 1RZ daylight, 1TS, (2ACT), (2AJF), (2AJW), 2ANZ, 2AQM, 2ATI, 2AWK, 2AWL, 2AXB, (2BBN), (2BBN), 2BDU, (2BFZ), 2BQH, 2BRB, (2BRC), (2DN), 2EL, 2FS, 2GR, (2KL), (2LH), (2RR), (2RU), (2WD), 2XK, 2ZL, 2ZV, 3ABI, 3AQR, 3BFV, 3BZ, (3FS), 3IH, 3JH, 3MM, (3QR), 3VY, 3ZY, 4GL, 8ADG, 8AIO, 8AMP, 8ANK, 8ANN, 8AQZ, 8BCL, 8BKR, 8BT, 8DE, 8DL, 8GO, 8GW, (8HJ), 8HY, 8IL, 8IV, 8JM, 8JQ, 8LF, 8LX, 8NQ, 8QM, 8QY, 8RQ, 8WR, 8WY, 8XK, (8XM), 8XV, 8YV, 9AZX, 9FW.

Spark—1ACO, 1ADC, 1ADL, 1AEV, 1AJF, 1AJU, 1ARY, 1AYQ, 1BDC, (1BDI), 1BKF, 1BWJ, 1DU, 1FB, 1FV, 1HO, 1TS, 1UL, 1ZE, 2AMZ, 2AQL, (2ARY), 2AST, 2AWF, 2BG, 2BGR, 2BK, 2BJF, 2BM, 2DI, 2EL, 2FF, 2JU, 2OM, 2OX, 2RM, 2RR, 2SQ, 2TS, 2UA, 2UK, 2WJ, 2WB, 2AHK, 2AQR, 3CC, 3FJ, 3FR, 3GX, 3HG, 3HJ, 3HX, 3IW, 3KM, 3LP, 3QF, 3QV, 3VV, 3WV, 3AFA, 3AFD, 3AGK, 3AHH, 3AOT, 3APB, 3AQV, 3AVR, 3AWP, 3AXC, 3AYN, 3BO, 3CH, 3EV, 3EZ, 3FE, 3FW, 3HP, 3OL, 3QM, 3RU, 3SP, 3TT, 3WY, 3YV, 3ZD, 9AAY, 9ME, 9VK, 9ZJ.

1JV, Whitman, Mass.

1AEV, 1AJF, 1ARY, 1AW, 1BDI, 1BPZ, 1CAK, 1CF, 1CK, 1CY, 1DH, 1DY, 1ES, 1FB, 1FF, 1HO, 1IN, 1NM, 1QD, 1QG, 1RX, 1SN, 1VBO, 1XAD, 1XB, 1XE, 1XF, 1XM, 1YC, 1ZE, 2ABT, 2ADL,

2AJF, 2AJU, 2AJW, 2ARY, 2AWL, 2AXB, 2BFZ, 2BG, 2BK, 2BM, 2BRC, 2DN, 2EL, 2FP, 2GA, 2JU, 2KL, 2OM, 2UA, 2WD, 2ZL, 3ALK, 3CC, 3CH, 3FS, 3HB, 3HX, 3IW, 3PS, 3VV, 3VW, 3ZO, 3XF, 4GL, 4QU, 8ABJ, 8AFN, 8AGK, 8AWP, 8APD, 8AQV, 8DE, 8DR, 8GY, 8LX, 8PE, 8QE, 8QYC, 9AL, 9XM.

1MD, Dorchester, Mass.

SPK:—1ACO, (1ADL) dalite, 1AEV, 1ARY, 1AW, 1AYQ, 1BDC, 1BLI, 1BM, 1FB, 1BDV, (1BPZ) dalite, (1CBX), 1CM, 1HO, (1OE), 1TS, (1ZE), 2AHK, 2AQL, 2ARB, 2ARY, 2AST, 2AWF, 2BG, 2BK, 2BM, 2DI, 2DN, 2EL, 2FP, 2JU, 2OM, 2RM, 2TS, 2UA, 2UK, 2WB, 3BZ, Can. 3BP, 3CC dalite, 3FM, 3GX, 3HB, 3HJ, 3HX, 3IW, 3OU, 3QF, 3WX, 3VW, 4EA, 4EY twillite, 4ZE, 8AFB, 8AFD, 8AGK, 8AHH, 8ADT, 8APB, 8AQX, 8AQV, 8AWP, 8AXC, 8AYN, 8CH, 8DY, 8EV, 8HP, 8HY, 8KH, 8ML, 8OI, 8QE, 8SP, 8TT, 8TY, 8WY, 8ZD, 9AAW, 9FS, 9ME, 9UH, 9ZJ.

C.W.:—1ADL, 1AGI, 1CAK, 1OE, 1RU, 1RZ, 1TS, 2ACT, 2AJF, 2AJW, 2AQM, 2AWL, 2AXB, 2BFZ, 2BRC, 2CT, 2DN, 2EL, 2FS, 2GR, 2KL, 2RR, 2WD, 2XK, 2ZV, 3AQR, 3BZ, 3FS, 3GR, 3IH, 3ZO, 3ZY, 4GL, 8AWP, 8BCL, 8BT, 8DE, 1PT, 8IL, 8DR, 8IV, 8JG, 8LX, 8NQ, 8QY, 8UH, Can. 9AL, 9HA.

1PT, Hopkinton, Mass.

Spark:—1AW, 1BM, (1CM), 1EK, (1FB), 1HO, 1OE, 1TS, (1ZE), 1ACO, 1ADL, 1AEV, (1AJF), 1AJU, 1AYQ, (1BDI), 1BGF, 1BJO, 1BJS, 1BJY, 1BNF, 1BYS, 2BG, 2BK, 2BM, 2CC, 2DA, 2DI, 2DJ, (2DN), 2DO, 2EL, 2FD, 2HW, 2JU, 2JW, 2KM, 2MP, 2OA, 2OE, 2OM, 2OX, 2RM, 2RR, 2SQ, 2TJ, 2TK, 2TS, 2UA, 2UH, 2UK, 2WB, 2WM, 2YM, 2ACY, 2ADH, 2ADK, 2AGC, 2AHU, 2AIM, 2AQL, 2AQL, 2ARB, 2ARY, 2AST, 2AWF, 2AXB, 2BCC, 2BCF, 2BFX, 2BJP, 3BG, 3CC, 3FJ, 3FR, 3GX, 3GR, 3HB, 3HJ, 3HX, 3IW, 3IX, 3KM, 3LP, 3OB, 3OU, 3PS, 3QF, 3QN, 3QW, 3RW, 3UC, 3UQ, 3VV, 3VW, 3WX, 3XF, 3ZE, 3AFE, 3AHK, 3ALC, 3AMP, 3APR, 3BER, 4AL, 4EA, 3BO, 3CD, 3CH, 3DS, 3DY, 3EC, 3EV, 3EZ, 3FE, 3FW, 3GO, 3GW, 3HB, 3HP, 3HU, 3HY, 3ID, 3JL, 3JK, 3KH, 3LQ, 3MM, 3OL, 3QM, 3RU, 3SP, 3TK, 3TT, 3UP, 3WM, 3WY, 3YV, 3ZD, 3ZN, 3ACF, 3ACP, 3ADG, 3AFA, 3AFB, 3AFD, 3AFH, 3WM, 3WY, 3YV, 3ZD, 3ZN, 3ACF, 3ACP, 3ADG, 3AFA, 3AFB, 3AFD, 3AFH, 3AGK, 3AHH, 3AHS, 3AIB, 3AIG, 3AJT, 3AOT, 3APE, 3AQV, 3AUE, 3AVT, 3AWP, 3AWZ, 3AXC, 3AYN, 3AYS, 3BFV, 3BKE, 3CP, 3GX, 3ME, 3MK, 3NY, 3PC, 3UH, 3UW, 3VK, 3ZN, 3AWW, 3AAY, 9DXM, Canada 3BF, 3LI.

C.W.:—1QN, 1RU, (1RZ), 1TS, 1AJF, 1BCN, 1BKA, 1BQE, 1CCZ, 1CT, 2DN, 2FP, 2FS, 2KL, 2KY, (2LH), (2RR), (2RU), 2SB, 2WD, 2WI, 2XG, (2XK), 2ABR, (3ACT), (2AJF), 2AJK, (2AJW), 2AQM, 2AWL dalite, 2AXB, 2BBN, 2BEZ, 2BFZ, 2BIF, 2BIR, 2BRB, 2BRC, 3BZ, 3CT, 3FS, 3IH, 3VY, 3ZE, 3ZY, 3ANJ, (3AQR), 4GL, 8BO, 8BT, 8DE, 8DR, 8GH, 8GO, 8GW, 8HJ, 8IL, 8IV, 8JM, 8JQ, 8LX, 8OA, 8OW, 8QM, 8QY, 8UH, 8WR, 8WY, 8XK, 8XM, 8AAZ, 8ECF, 8AIO, 8AJF, 8ANK, 8AQZ, 8AYM, 8BCL, 8ADU, 8BKL, 9AW, 9BP, 9UV, 9AZX, Canada 9AL.

1CAK, John M. Wells, Southbridge, Mass.

All CW unless otherwise labeled:—(1ABY), 1ADL spk., 1AOL, (1ANQ), 1CF, (1CCZ), (1DH), 1FF, (1OE spk.), (1PT), (1QN), 1RU, 1RX spk., (1RZ fone), (1TS spk. & CW), 1UN, 1WP spk., 1XE fone, 1ZE spk., (2ACT), 2ADL, 2AGC, 2ALC, (2AJF), 2AJR, (2AJW), 2AWK, (2AWL), 2AXX, (2BBN), (2BCL), (2BFZ), 2BG, 2BIR, 2BZY, 2CC spk., 2DN, 2EL spk., 2GR, 2JA spk., (2LH Can.).

20M spk., 2PE, (2RR), (2RW), (2WD), 2WI, 2KF, (2XK), 2ZL, 2ZV, 3BD, 3BG, 3BZ, 3GX, 3ZO fone, 4GL, (5AIO), 5AMT, (5DE), (5HA), (5HJ), 8OW, 8QY, (8XM), (8XR), 8ZO, 8ZY, 9AZX.

1VQ, New Haven, Conn.

Spark:—1AJF, 1AYO, 1BM, 1BOE, 1HO, 1OZ, 1QCZ, 2ARY, 2AXB, 2AYY, 2BCF, 2BG, 2BJ, 2BUT, 2DI, 2DK, 2EL, 2GR, 2JU, 2MN, 2MP, 2OM, 2UA, 2UK, 2WD, 3CC, 3EH, 3GH, 3IW, 3QH, 3RW, 3SJ, 3VW, 3BF, 3FR, 3UQ 4EY (very qsa), 5AFB, 5AFD, 5AFK, 5AGK, 5AHL, 5AHU, 5AJT, 5ANW, 5AQV, 5AWP, 5AWX, 5BFV, 5BO, 5CF, 5DY, 5EV, 5LX, 5OI, 5QM, 5SP, 5UP, 5WY, 5ZD, 9GX, Canadian 3BP.

C.W.:—1AJF, 1ANQ, 1AZJ, 1AXM, 1IV, 1RU, 1RZ, 1UN, 2ACT, 2AJF, 2AJW, 2ANG, 2AWK, 2AWL, 2AXB, 2BBN, 2BFZ, 2BML, 2BRC, 2DN, 2EL, 2FS, 2KL, 2KP, 2OE, 2UD, 2WD, 2XD, 3BZ, 3VV, 3ZZ, 4GL, 5AAZ, 5AKS, 5AIO, 5BCL, 5DE, 5NQ, 5OW, 5QY, 5XM, 5ZG.

ITS, B'ato, Conn.

Spark:—(1ACG), 1ACO, 1ADC, (1ADL), 1AEV, 1AHF, 1AJU, 1AKG, (1ANT), (1ARY), (1AUV), 1AW, 1AXI, (1BDC), 1BDI, (1BDT), (1BDV), 1BFE, (1BGF), (1BJN), 1BJO, 1BJS, (1BNF), 1BOP, 1BP, 1BPZ, 1BRW, 1BWY, 1BYS, 1CK, 1CP, 1EK, 1FB, 1FU, 1GM, 1RK, 1RO, 1LS, 1OE, (1RX), 1SL, (1SN), 1UL, (1ZE), 2ACY, 2AGC, 2AQL, 2ARY, 2AST, 2AWF, 2AXB, 2BCF, 2BG, 2BK, 2BM, 2CC, 2DA, 2DN, 2DO, 2EL, 2FP, 2GR, 2JU, 2JW, 2NH, 2OM, 2OX, 2RM, 2RR, 2SQ, 2TS, 2UA, 2UC, 2WB, 2WM, 3AC, 3AHK, 3ALC, 3CC, 3GX, 3HJ, 3HX, 3IW, 3KM, 3LI, 3NB, 3OU, 3UC, 3VW, 3VV, 3WX, 3ZF, 3ZO, 4AL, 4EA, 4EY, 4IE, 5ACF, 5ACP, 5ACS, 5AFA, 5AFB, 5AFD, 5AGK, 5AHH, 5AIO, 5AJT, 5AKW, 5AMK, 5ANO, (5AOT), (5APE), 5AQV, 5ARD, 5ARK, 5ASE, 5AV, 5AVI, (5AWP), 5AAC, 5AXO, (5AYN), 5AYS, 5BA, 5BAH, 5BDY, 5BFV, 5BO, 5BP, 5CD, 5CH, 5DV, (5DY), 5EV, 5EZ, 5FE, 5HB, 5HG, (5HP), 5HY, 5ID, 5JL, 5JP, 5JQ, 5KH, 5LQ, 5ML, 5MM, 5NO, 5OA, 5OI, 5PU, 5PV, 5QB, 5QE, 5QM, 5RU, 5SP, 5TJ, 5TK, 5TT, 5TY, 5UP, 5WA, 5WY, 5WZ, 5XS, 5YV, 5ZD, 5ZN, 5ZW, 9AAW, 9AAV, 9ABH, 9ACY, 9AFK, 9AGG, 9ALH, 9AMT, 9AQM, 9ATQ, 9AWZ, 9BP, 9CP, 9DAX, 9DXM, 9HM, 9HR, 9MC, 9ME, 9MK, 9PC, 9PN, 9UH, 9UU, 9UW, 9VK, 9VL, 9YAC, 9ZJ, 9ZL, 9ZN, Canadian 3BP, 3KG.

C.W. Stations:—(1AAU), 1ABY, 1ACG, 1AGI, 1AHK, 1AJF, (1ANQ) fone, 1AR, 1AYK, (1AZX), 1BEH, 1BES, (1BK), (1BYM), (1CAK), 1CCZ, 1CDR, 1CF, 1CK, 1DH, 1DR, 1ES, 1EF, 1OE, 1PT, 1QN, 1RU fone, 1RZ, 1UN, 1XE fone, 1XV fone, 2ACR, 2ACT, 2ADL fone, 2AJF, 2AJW, 2ANZ, 2AWK, 2AWL, 2AXB, 2BBN, 2BEB, 2BFZ, 2BRB, (2DN), 2FP, 2GR, 2KL, 2LH, 2MW, 2RR, 2RU, 2WD, 2WL, 2ZK, 2ZL, 2ZY fone, 3AAE, 3AQR, 3BZ, 3CC, 3FS, 3HB, 3HX, 3PH, 3VV, 3ZO, 3ZY, 4GL, 5AAZ, 5AFA, 5AIO, 5AIX, 5AJF, 5AMF, 5AQF, 5AQZ, 5AYN, 5BCL, 5BDP, 5BL, 5BJX, 5BN, 5BO, 5BT, 5DE, 5DR, 5GW, 5HA, 5HJ, 5II, 5IV, 5JM, 5JQ, 5LF, (5LX), 5NQ, 5OA, 5OI, 5OW, 5PJ, 5QY, 5UJ, 5WY, 5XU, 5XV, 5ZG, 9AAV, 9AZX, 9FW, 9TK, 9XM, Canadian 9AL.

E. W. Hadley, Bristol, N. H.

1SN, 1RX, 1CCQ, 1FW, 1DH, 1OJ, 1CCL, 1PT, 1ARY, 1ZE, 1FB, 1CDR, 1FBK, 1BDE, 1AEV, 1ADC, 1EU, 1HO, 1CM, 1CK, 1JH, 1OE, 1CA, 1BPZ, 1XE, 1RRI, 1XD, 1CP, 1AR, 1WA, 1FBJ, 1BDT, 1ACO, 1BDC, 1BYS, 1BWK, 1BAS, 1APT, 1IJ, 1BES, 1ABY, 1MB, 1AMI, 1FF, 1BWK, 1DR, 1WP, 1AJF, 1BOP, 1AKG, 1XD, 2AWL, 2WB, 2OM, 2LH, 2BG, 2AJ, 2ZM, 2LL, 2ARY, 2EL, 2AJF, 2BGH, 2AWF, 2GX, 2XD, 2ZW, 2AXX, 2RR, 2AXB, Can. 3BP, 3FY, 3AJ, 3VS, 3OV, 3ZO, 3CC, 3HX, 3ZJ, 3AAE, 3AQR, 3MZ, 4GL, 4EL, 5QM, 5AYN, 5AWP, 5FW, 5AJ, 5YV, 5KK, 5OW, 5DY, 5AGK, 5IL, 5ANK, 5DE, 5RP, 5SP, 5AOT, 5AHV, 5AKS, 5BT, 5OI, 5ZY, 5WY, 5ZG, 5ADH, 5AHH, 5AJF, 5XV, 5HV, 5SE, 5RE, 5FE, 5EA, 5BDY, 5PN, 5AW, 5WO, 9ZJ, 9ZN.

1BES, Providence, R. I.

Cw.:—1RU, 1RZ, 1TS, 1UN, 1XB, 1XX, 1AJF,

1AZJ, (1AZW), (1BWK), 1CAK, 2DN, 2FS, 2GR, 2KL, (2RR), (2RU), 2ZL, 2ZV, 2ZZ, 2AAE, 2ACT, 2ADL, 2AGI, 2AJF, 2AJW, 2AWL, 2AXB, 2BFZ, 2BRC, 3BZ, 3HB, 3VV, 3AGR, 4GL, 5BQ, 5DE, 5DR, 5LF, 5AIO.

Spk.:—1HO, 1HK, 1TS, 1ZE, 1AHL, 1AFU, 1ARY, (1AZK), 1BDC, 1BQE, 2BK, 2BP, 2CC, 2CY, 2GR, 2JU, 2OA, 2OM, 2RM, 2TS, 2UA, 2UC, 2WB, 2AID, 2AIM, 2ARY, 2AST, 3GU, 3GX, 3LF, 3UQ, 4EY, 5HP, 5ZD, 5AGK, 5APB, 5AWP, 9ZJ.

1BDI, Augusta, Maine

1ACB, (1ACO), (1ADL), 1ADY Cw., (1AEV), 1AHF, 1AJF, (1AKG), 1APT, (1ARY), 1AW, 1AXE, (1AXI), 1AYQ, 1AZJ, 1BDC, (1BDK), (1BDQ), 1BDT, 1BGF, (1BHR), 1BJE, 1BJN, (1BKK), 1BKP, (1BOP), (1BPZ), 1BWK, 1CDR, (1CF), 1CK, 1CM, 1DR, (1ES), 1FB, 1FF, 1FU, 1GM, 1HK, 1HO, (1IT), 1OE, 1OJ, (1PT), 1QG, 1RX, 1RZ, (1SN), 1TS, 1UAG, (1UL), (1ZE), 2AHK, 2AJF, 2AJW, 2AQL, 2AQM, 2ARY, 2AST, (2AWF), 2AWL, 2AXB, 2BBN, 2BFZ, 2BLG, 2BG, (2BK), 2BM, 2BRC, 2BVK, 2CC, 2CY, 2DA, 2DAK, (2DN), 2EL, 2FS, 2FP, 2GR, 2OA, 2OM, 2JU, 2RM, 2RR, 2RU, (2UA), 2UC, 2UK, 2VV, 2WB, 2XF, 2XJ, 2ZV, 3AQR, 3CC, 3GX, 3HB, 3HJ, 3HX, 3IH, 3OU, 3VW, 3WX, 3XP, 4GL, 5ACF, 5AFB, 5AFD, 5AGK, 5AHH, 5AIO, 5AJB, 5AKQ, 5AOT, 5APB, (5AWP), 5AYN, 5AYS, 5BDU, 5BT, 5DE, 5DR, 5DY, 5JM, 5NQ, 5QNK, 5QY, 5SP, 5ZZ, 9ZN.

2AVE, Jamaica, L. I.

1AW, 1CK, 1FB, 1HO, 1TS, 1ZE, 1ADL, 1BDC, 1BDI, 1BDT, 1AEV, 1AJF, 1AOL, 1BPZ, 1AST, 1BWK, (2AB), 2BG, 2CT, 2DN, 2FP, 2HI, 2IA, 2IT, 2KL, 2QR, 2RR, 2RU, 2SB, 2UJ, 2WD, 2XG, 2XK, 2ZL, 2ZM, (2ZV), 2ABA, 2ABD, 2ADS, 2AFB, 2AHU, 2AJF, 2AJW, 2ANZ, 2AUZ, 2AWD, (2AWK), (2AWL), (2AXB), 2BBN, 2BDU, 2BEB, 2BFZ, 2BIR, 2BNL, 2BQH, 2BRB, (2BUA), 2BUM, 3BG, 3BZ Cw., 3CC, 3DW, 3EX, 3GR, 3GX, 3HB, 3HJ, 3HW, 3HX, 3IW, 3LL, 3LP, 3LW, 3OU, 3RW, 3UC, 3VV, 3VW, 3ZO, 3ZY, 3AFE, 3AQR, 3AWF, 4AL, 4EA, 4EY, 4FD, 4GL, 5FV, 5CH, 5DE, 5DJ, 5DY, 5EC, 5EV, 5FE, 5FG, 5GW, 5IL, 5JZ, 5KH, 5LU, 5LW, 5LX, 5QE, 5RU, 5SP, 5TD, 5TT, 5TY, 5UA, 5UP, 5WA, 5WV, 5WY, 5XK, 5YH, 5ZA, 5ZD, 5AAV, 5ACF, 5AFA, 5AFD, 5AGK, 5AHH, 5AIO, 5AJT, 5AMF, 5AOT, 5APP, 5AQV, 5ARD, 5AUE, 5AVT, 5AWP, 5AXC, 5AYN, 5AYS, 5BFV, 5ME, 5UH, 5UU, 9ZJ, 9ZN, 9AAW, 9AIK, 9AIR, 9AWZ, 9DWM, Can. 3BP, 9AL.

2BFA, Troy, N. Y.

All C.W. 1AAU, 1AE, 1BJO, 1BKA, 1BYB, 1CAK, 1CCZ, 1CF, 1DH, 1DR, 1IN, 1UNJ, 1XD, 1XM, 2ADL, 2AQM, 2BGH, 2BJE, 2BRC, 2DN, 2JU, 2RU, 2ZL, 3ZO, 5ANK, 5DE, 5XU.

2KV, Bronxville, N. Y.

Spark:—1ADL, 1AJF, 1BDC, 1BDI, 1IA, 1OJ, 1RX, 1ZE, 3ACE, 3AHK, 3AQR, 3AS, 3BG, 3BZ, 3CC, 3GR, 3GX, 3HB, 3IW, 3OU, 3PS, 3RP, 3RW, 3UC, 3VS, 3VW, 3XF, 3ZF, 4EA, 4EY, 4GX, 5ACF, 5ACP, 5AFA, 5AFD, 5AGK, 5AHH, 5AIG, 5AJT, 5AOT, 5APB, 5AGV, 5AWP, 5AXC, 5BFV, 5CD, 5DY, 5EV, 5FE, 5HF, 5HU, 5JE, 5KH, 5LQ, 5LW, 5SP, 5TT, 5TY, 5UP, 5WY, 5YV, 5ZA, 5ZD, 5ZN, 9HM, 9UH, 9UU, 9ZN.

C.W.:—1AZJ, 1CK, 1ES, 2AJF, 2AOS, 2AWL, 2BFZ, 2DN, 2GR, 2KL, 2RR, 2RU, 2AAE, 2ADT, 3FS, 3HX, 3PB, 3ZY, 4GL, 5AHL, 5AIX, 5ANK, 5DE, 5LH, 5NQ, 5RQ, 5XK, 5XV.

2AEQ, New York City

Spark:—1CK, 1GM, 1HO, 1OE, 1ZE, 1BCU, 1BDC, 1BJN, 1BPZ, 1BWY, 2BM, 2BP Can., 3CC, 3FR, 3GX, 3HX, 3IW, 3EV, 3SP, 3ZJ, 3AGK, 5AHH, 5AOT, 5APB, 5AWP, 5BFV.

C.W.:—1CF, 1ES, 1RZ, 1UN, 1QN, 1PT, 1AGI, 1AJF, 1AOL, 1AWB, 1AZJ, 1BEP, 1BJK, 1BWK, 1CAK, 1CCZ, 3BZ, 3CT, 3FS, 3HB, 3ZY, 3AJJ, 3AQR, 4GL, 5BT, 5CF, 5DE, 5FB, 5GW, 5HJ, 5LX, 5NQ, 5OA, 5QY, 5WR, 5ZC, 5ALY, 5AMZ, 5BDU, 9AL Can.

2BQU, Staten Island, N. Y.

1CK, 1CZ, 1FB, 1HK, 1HO, 1KE, 1OE, 1RX, 1ZE, 1ADC, 1ADL, 1AEV, 1AGN, 1AJF, 1AJU, 1ARY,

1BDC, 1BDT, 1BJN, 1BPZ, 1BWZ, 1BYH, 1CAK
C.W., 3CC, 3GX, 3KM, 3MZ, 3OU, 3RW, 3UC,
3ABG, Can., 3BP, 3BO, 3CH, 3DY, 3EV, 3HI, C.W.,
3KH, 3QE, 3QM, 3SP, 3TO, 3TT, 3TY, 3WA, 3WY,
3ZZ, 3AFA, 3AFB, 3AGK, 3AHH, 3AHU, 3AJI,
3APB, 3AVI, 3AWP, 3AYN, 3BPV, 3BP, 3MC,
3UH, 3ZJ, 3ZL, 3AAW.

20M, Ridgewood, N. J.

1ACD, 1ACG, 1ADL, 1AJP, 1AW, 1AWP, 1IAZJ,
(1BDC), 1BDI, 2BDL, 1BDT, (1BJN), (1BPZ),
1CAK, 1CCZ, (1CK), 1CP, 1CY, (1DAL), 1DR,
(1DY), 1FX, (1GM), 1HK, (1HO), (1JAP), (1OE),
1PT, 1QN, (1SN), 1XT, (1ZE), (2AWF), 3ABG,
3AC, 3ADB, 3AGK, 3AHK, 3AQR, 3AS, 3AZR,
3BA, 3BG, (3CC), (3CK), 3EX, 3FJ, 3FR, 3FW,
3GL, 3GR, 3GX, 3HB, 3HG, 3HJ, 3HX, (3IW),
3KM, 3MY, (3OU), (3GN), 3RW, 3UC, 3VV, C.W.,
(3VW), 3WW, 3WX, 3XF, (3XU), 3ZA, 3ZF,
3ZO, 3ZY, (3BP Canadian), 4AL, 4BX, (4EA),
4EY, 4GL, C.W., 4GN, 4AAD, 4ACF, 4AF, 4AFB,
(4AFD), 4AFT, 4AG, (4AGK), 4AHH, 4AHS,
4AIG, 4AIO, 4AJ, (4AJJ), (4AKW), 4ANK, C.W.,
4ANT, (4AOT), 4AP, 4APB, 4APV, 4ARD, 4ARK,
4ARJ, 4AWB, 4AWD, (4AWP), 4AXC, 4AY, 4AYN,
4BFV, (4BO), 4CH, 4DE, 4DV, 4DY, 4EC, 4EV,
(4EZ), 4FE, 4GA, 4GO, 4GP, (4GW), 4HR, 4HU,
4JE, 4JL, 4JM, 4JQ, 4KH, 4LX, (4MM), (4OI),
4OJ, 4PL, 4PT, 4PU, 4QE, 4RQ, 4RU, (4SP), 4TT,
4TY, 4VH, 4WY, 4WZ, 4XF, 4XK, 4XM, 4XJ,
(4YV), 4YW, (4ZD), 4ZE, 4ZN, 4ZW, 4ZZ, 9AAW,
9AL, 9AWZ, 9BP, 9CP, 9GT, 9LQ, 9ME, 9PC, 9UF,
(9UH), 9UK, 9UU, 9ZC, 9ZJ, 9ZN, 9ZW.

2BBN, Carlstadt, N. J.

1ABY, 1AHK, 1ANQ, (1AZJ), 1BES, (1CAK),
(1CF), 1ES, 1PT, 1RU, 1UN, (2AJF), 2AMF,
(2AXB), 2AJW, 2BML, (2BW), (2MW), 2BAX,
3BZ, 3FS, 3HX, (3VV), 3ZO, 3ZY, (4GL), 4AIO,
4ANK, 4AQZ, 4DE, 4DR, 4DX, 4HA, 4IV, 4LX,
4QM, 4QY, (4WY), 4XK, 4XM, 4AZX, 4FW,
Canadian 9AL.

2AJF, Passaic, N. J.—All C.W.

(1CF), 1DH, 1DR, 1ES, 1FF, (1PT), (1QN),
1XE, 1AHK, (1AJP), (1ANQ), (1IAZJ), (1BWK),
(1CAK), (1CCZ), 1CDR, (1TBE), (3BZ), 3CC,
3CT, (3FS), (3HB), 3HG, 3HX, 3QS, (3VV), 3XF,
(3ZY), 3AAE, 3AQR, (4CO), (4GL), 4BO, 4BT,
(4DE), 4DR, 4IL, 4IQ, 4IV, 4JQ, 4LF, (4LX),
(4NQ), (4OZ), (4QY), (4XM), 4XV, 4ZB, 4ZG,
(4AIO), (4ANK), (4AQZ), (4ASB), (4BCI),
(9FW), 9AZX, NMW.

2AUG, Ridgewood, N. J.

Indoor Aerial

C.W.—1CF, 1DR, 1ES, 1PT, 1QN, 1RU, 1ABY,
1ANQ, 1AZD, 1BES, 1BWK, 1CAK, 1CCZ, 1CTS,
2AD, 2BG, 2BH, 2CT, 2DN, 2FS, 2FP, 2GR, 2IA,
2KL, 2RR, 2RU, 2TS, 2WD, 2WI, 2XK, 2ZE, 2ZV,
2ABR, 2ACF, 2ACT, 2ADL, 2ADR, 2AJF, 2AJW,
2ANZ, 2AOS, 2AQW, 2AWK, 2AWL, 2AXB, 2BBN,
2BEB, 2BFZ, 2BGH, 2BIR, 2BNL, 2BRB, 3BZ,
3HB, 3VV, 3ZO, 3ZY, 3AAE, 4GL, 4BT, 4DE,
4DR, 4GW, 4HA, 4IL, 4JH, 4JM, 4JQ, 4JU, 4LF,
4LX, 4NQ, 4OW, 4PN, 4QY, 4UK, 4WY, 4XM,
4ZN, 4ACF, 4AHQ, 4AIO, 4AMF, 4AQZ, 4AYW,
4BCI, 4BOI, 9AL (Can.), NSF.

Spark—1AE, 1AW, 1FB, 1HO, 1OE, 1OJ, 1RM,
1RX, 1SN, 1ADL, 1AJP, 1ARY, 1AXI, 1BDC, 2BG,
2BK, 2DI, 2DJ, 2EL, 2JU, 2NI, 2OA, 2OM, 2OX,
2RM, 2SQ, 2TS, 2UA, 2UK, 2WB, 2ZM, 2AQL,
2AQL, 2ARB, 2ARM, 2ARY, 2AST, 2ATL, 2ATP,
2BCF, 3BP, 3CC, 3GX, 3HJ, 3IW, 3LI, 3MH, 3OU,
3AHK, 4BE, 4EA, 4GX, 4FV, 4AU, 4BC, 4BO,
4CP, 4CH, 4CN, 4DY, 4EA, 4EC, 4EV, 4EZ, 4FE,
4GW, 4HJ, 4HP, 4JE, 4JQ, 4KH, 4LU, 4OI, 4OJ,
4PU, 4QE, 4RU, 4SP, 4TJ, 4TK, 4TT, 4TY, 4UG,
4UP, 4WA, 4WY, 4XV, 4ZD, 4ZE, 4ZZ, 4AFA,
4AFD, 4AFK, 4AFS, 4AGK, 4AHH, 4AJT, 4ANO,
4AOT, 4APB, 4APV, 4ARD, 4AVO, 4AVT, 4AWP,
4AXC, 4AYN, 4AYS, 4BDY, 4BFV, 4BNI, 9AR,
9BP, 9FH, 9HM, 9JK, 9MK, 9NQ, 9OX, 9PC, 9PN,
9PW, 9UH, 9UU, 9UV, 9VL, 9WC, 9ZJ, 9ZL, 9ZN,
9AAW, 9AAY, 9AKM, 9ALH, 9AUF, 9AWZ,
9DXM.

2RR ex 2AFP, Paterson, N. J.

C.W.—1AIS, 1AKB, (1BES), 1BWK, (1CAK),

1CCZ, 1DH, 1DR, (1ES), 1FF, (1PT), 2ABR,
(2ACT), 2ADL, 2AJE, (2AJF), 2AJW, 2AMF,
(2ANZ), (2AOS), (2AWL), (2AWK), 2AXB,
(2BBN), 2BEB, (2BFZ), 2BGA, (2BG), 2BH,
(2BIR), (2BIV), (2BRB), (2DN), (2GR), 2IA,
2MW, (2RU), 2WD, 2WI, (2XK), (2XV), (3AQR),
3BFV, 3BP, 3BZ, 3FS, 3VV, (3ZY), 4GL, (4AIO),
4AMF, (4BCI), 4BL, 4BK, 4BN, (4BT), (4DE),
4DR, 4IL, 4IQ, 4IV, 4JM, 4JQ, 4KM, 4LF, (4LX),
(4NQ), 4QY, 4UH, (4UK), 4WR, 4WY, 4XK, 4XM,
4ZU, 4ZY, 9FW, 9AZX.

Spark:—1ADL, (1AEV), 1OJP, 1ARY, 1AXI,
1BDC, 1BDT, 1BL, 1BPZ, 1FB, (1OE), 3BZ,
3CC, 3IW, 3LP, 3VW, 4EA, 4EY, 4FV, 4AFD, 4AH,
4AHH, 4AHS, 4AIG, 4AFK, 4AJT, 4ANW, 4APB,
4AQV, 4ARA, 4ARB, 4ARK, 4AWL, 4AWP, 4AJT,
4AXC, 4AYN, 4CD, 4EV, 4EZ, 4FE, 4HR, 4JL,
4MH, 4OI, 4TT, 4TY, 4UW, 4XU, 4ZD, 4ZN, 4AFK,
4AMT, 9FS, 9GX, 9MC, 9PC, 9UH, 9ZJ, 9ZN,
Can. 3BP.

3FP, Trenton, N. J.

1AB, 1ACG, 1ADL, 1AEV, 1AHK, 1ALM, 1ANQ,
1ANZ, 1ARY, 1AW, 1AWD, 1AYK, 1BEC, 1BDC,
1BDP, 1BPZ, 1BWK, 1CAK, 1CCZ, 1CDW, 1CF,
1DH, 1RPZ, 1ES, 1FS, 1HDC, 1HF, 1INB, 1OE,
1QN, 1TS, 1UK, 1UN, 1ZE, 2ABP, 2ADL, 2AFP,
2AGF, 2AGX, 2AJF, 2AMX, 2ARY, 2AVR, 2AXX,
2BBN, 2BFZ, 2BZH, 2BML, 2BSC, 2DS, 2EL,
2GJ, 2GM, 2GR, 2HG, 2JU, 2KY, 2NO, 2RU, 2TS,
2UA, 2UK, 2XF, 2XG, 2XJ, 2XK, 2ZL, 2ZM, 2ZV,
3ABI, 3AEV, 3AM, 3BZ, 3CT, 3DW, 3GX, 3HB,
3OU, 3SB, 3VS, 3VV, 3WX, 3XF, 3ZO, 3ZV, 3ZY,
4EY, 4GL, 4GX, 4IE, 4AAZ, 4ACF, 4ACP, 4AFD,
4AFO, 4AGK, 4AHH, 4AIB, 4AIE, 4AIB, 4AJT,
4AKJ, 4AKW, 4AMQ, 4AOC, 4APB, 4AQZ, 4ARD,
4ARM, 4AWP, 4AXC, 4AYN, 4AYS, 4BCI, 4BDP,
4BFG, 4BK, 4BO, 4BP, 4CH, 4DR, 4DY, 4EC, 4EO,
4EV, 4FE, 4GW, 4HA, 4HG, 4HR, 4HP, 4HY,
4JL, 4JM, 4JQ, 4JU, 4LH, 4LM, 4LQ, 4LX, 4MM,
4NQ, 4OA, 4OC, 4OJ, 4OW, 4PT, 4QE, 4QY, 4RU,
4TY, 4WY, 4XU, 4YF, 4YU, 4YV, 4ZA, 4ZD, 4ZN,
4ZR, 4ZW, 4ZZ, 9AGO, 9AJP, 9AJX, 9AMT, 9AZX,
9FG, 9FQ, 9FS, 9HR, 9KO, 9LQ, 9MC, 9ME, 9QH,
9UW, 9ZJ, 9ZL, 9ZN, Canadian 3BP, 3LI, 9AL.

3HS, Washington, D. C.

C.W.: 1AW, 1AAU, 1ANJ, 1BWK, 1CAK, 1KAA,
1QN, 1RU, 1RZ, 1SA, 2AJF, 2AJL, 2AJW, 2AWL,
2BBN, 2BFG, 2BFZ, 2DN, 2FS, 2KL, 2RU, 2TS,
2WB, 2XK, 2ZL, 3AR, 3AQR, 3BA, 3BZ, 3FS,
3GR, 3HB, 3IH, 3VV, 3ZZ, 4GL, 4AAZ, 4AFO,
4AIO, 4AJP, 4ANK, 4BM, 4BT, 4BCI, 4DE, 4GW,
4HA, 4IL, 4IV, 4IST, 4JM, 4LF, 4NQ, 4OA, 4OW,
4QY, 4WR, 4WY, 4XM, 4AW, 4AAV, 4AZX, 4FW,
Canadian 9AL.

SPARK: 1AP, 1AXU, 1BDC, 1HO, 1ZE, 2AL,
2AR, 2ACT, 2AHU, 2ARY, 2BC, 2BG, 2BK, 2EL,
2JU, 2RM, 2TS, 2UA, 2UK, 2WB, 3AC, 3AES,
3AHK, 3AEV, 3CC, 3HJ, 3HX, 3IX, 3LP, 3OJ,
3OU, 3QF, 3UC, 3UG, 3YC, 3ZO, 4BI, 4EA, 4EY,
4GN, 4DA, 4ZA, 4AP, 4ACD, 4ACW, 4AFB, 4AFD,
4AFS, 4AGK, 4AHH, 4AHY, 4AIG, 4AIO, 4AJT,
4AKJ, 4APE, 4ARD, 4ARP, 4AWP, 4AWX, 4AXC,
4AXV, 4AYN, 4BO, 4BBU, 4BDP, 4BDY, 4BHV,
4CL, 4DV, 4DY, 4EA, 4EF, 4EV, 4EZ, 4HY, 4JU,
4KH, 4LH, 4MM, 4NO, 4NJ, 4RV, 4SP, 4TD, 4TT,
4WA, 4WQ, 4WV, 4WY, 4XC, 4YV, 4ZA, 4ZD,
4AAW, 4AJO, 4ME, 4UH, 4UU, 4ZJ, 4ZN, Cana-
dian 3BP, 3LI.

3BZ, Danville, Va.—All C.W.

1RZ, (1AZJ) 1BWK, 1CAK, 1CCZ, 2ZY, (2XK),
2BBN, (2AWL), (2ADL), (2AJF), 2AJW, 2RR,
2AJR, (2FS), (2BFZ), 2GR, 2RV, 2KL, 2WR,
(3ZY), 3AQR, 3VV, (4GL), (4BY), (4DA),
(4ALW), 4DE, 4ANK, 4YA, 4AIO, 4HA, (4WY),
4BCI, 4GWD, 4AAZ, 4AKS, 4BO, 4BT, 4AJP,
(4LX), 4XM, 4NQ, 4ASB, (4OA).

3IW, Clarendon, Virginia

(1BDC), 1DDT, 1GPZ, (1HO), 1OE, (1SN), 1ZE,
2AJW, 2ARR, (2ARY), 2AWL, 2BFZ, (2BG),
(2BK), 2CY, 2DI, 2DJ, 2DN, 2EL, 2FD, (2FP),
2GR, 2JU, 2KL, 2NR, 2OA, 2OE, (2OM), (2RM),
2RR, 2RU, 2TS, 2UA, 2UE, 2UH, 2UK, (2WB),
2XK, 3AEV, 3BFV, 3BF, 3BG, 3BP, 3BZ, 3CC,
3GX, 3HJ, 3HX, 3QF, (3QN), 3RW, 3VY, (3VW),
4AL, 4BQ, 4DT, 4EA, 4EM, 4EY, 4GL, (4IE),

4XK, 5DA, 5FV, 8ACF, (8AFA), (8AFB), (8AGK), (8AHH), (8AHS), 8AIB, 8AIO, 8AJT, 8AJV, 8ANO, 8AOL, 8AOT, 8APB, (8AQV), 8ARK, 8AVO, (8AVT), (8AWP), (8AXC), (8AYN), (8AYS), 8BDY, 8BHV, (8BO), (8CD), 8CF, 8CH, (8DE), (8DV), (8DY), (8EA), 8EF, (8EV), (8EZ), 8FE, 8GO, 8HG, 8HJ, 8HY, 8ID, 8IL, 8JE, 8JQ, 8KH, 8LW, 8ML, 8NQ, 8OA, 8OI, 8OW, 8PW, 8PZ, 8QW, 8QY, 8RQ, (8RU), (8SP), 8TJ, 8TK, (8TT), 8TY, 8WA, 8WY, 8WZ, 8XV, (8YV), 8ZA, 8ZD, 8ZN, 8ZV, 9AIR, 9AWZ, 9BP, 9DXM, 9FS, 9MC, (9UH), 9UU, 9UW, 9VK, 9WO, 9ZJ, 9ZN.

3ARN, Chevy Chase, Md.

1AT, 1AU, 1BDC, 1BPZ, 1CAK, 1CK, 1HO, 1ZE, 2AER, 2AJW, 2ARD, 2ARY, 2AWL, 2BBN, 2BFZ, 2BG, 2BK, 2DJ, 2EL, 2JU, 2KL, 2LJ, 2NS, 2OE, 2RR, 2RU, 2UW, 2TS, 2UA, 2UE, 2UK, 2WB, 3AC, 3AHK, 3BG, 3BZ, 3CC, 3GX, 3KE, 3OU, 3VV, 3ZF, Canadian 3BP and 3L, 4AL, 4GL, 4IE, 4XK, 5FV, 8ACF, 8ACP, 8AFA, 8AFD, 8AFS, 8AGK, 8AHH, 8AII, 8AIO, 8AJP, 8AJT, 8ANK, 8ANR, 8APB, 8APP, 8AQV, 8AOW, 8AWC, 8AWP, 8AWY, 8AXC, 8AYN, 8AYS, 8BBU, 8BCI, 8BIW, 8CF, 8DE, 8DR, 8DV, 8DY, 8EA, 8EV, 8FE, 8GO, 8HJ, 8HU, 8HY, 8IL, 8JW, 8IV, 8JE, 8JM, 8LX, 8C.W., 8NQ, 8OI, 8OW, 8QY, 8RQ, 8RU, 8RY, 8SP, 8TB, 8TD, 8TT, 8TY, 8WV, 8WY, 8WZ, 8XM, 8YN, 8YU, 8YV, 8ZN, 9AAW, 9AW, 9ALB, 9DWM, 9FU, 9GX, 9HM, 9MC, 9ME, 9PC, 9UH, 9UU, 9VK, 9VZ, 9WC, 9WK, 9ZJ, 9ZN.

3CC, Abington, Pa.—8/15—9/15

(1ARY), (1AJP), 1ABB, (1ADL), (1ANZ), 1AHF, 1ASF, (1BDC), 1BPZ, 1BDI, (1BGF), 1BKP, 1BDT, (1BJN), 1BWY, 1GBP, (1AW), 1CK, 1CY, (1HO), 1HK, (1FV), (1GM), (1OE), 1RX, 1SN, 1TS, 1UH, 1ZE, (2ARY), (2AHU), 2ARB, 2AVY, (2AWP), 2AM, (2BK), (2DJ), (2DA), 2DW, 2DN, 2EL, 2OA, (2OM), 2OE, 2NF, 2TK, (2TS), (2UK), (2UA), (2JU), 2UE, (2WB), 2ZM, (3ZO), 3AHK, (3GX), 3V, (3QW), (3ZV), 3UC, (4EY), 5FV, (8ACF), 8AXC, (8AFD), (8AWP), (8AJT), (8AJT), (8AYN), (8AQV, (8AOT), 8AKQ, (8ADQ), (8APB), (8AHH), (8AGK), (8AYS), (8BHV), 8BDY, 8BK, (8BO), (8DY), (8EA), 8PU, 8RU, (8WY, 8TJ, (8OI), 8ZA, (8ZD), (9AMT), (9AQM), 9BP, 9CF, 9FS, 9HG, (9GO), 9JN, 9LQ, 9MC, 9ME, 9UW, 9ZJ, Canada 2AX (3BP).

C.W. Stations: 1CDR, (1RZ), 1DH, (1UN), (1BES), 1BWJ, 2BGH, 2ZL, 2ZV, 2AJW, 2BFZ, 2BRB, 2BGM, 2EL, 2CT, (3ANV), (3HX), (3IH), (3AJ), (3EAD), (3LH), 3FS, 3BZ, 3SJ, 3HB, (3HJ), 8DE, 8ACF.

3ZO, Parkersburg, Pa.

1CF, 1ZE, 1BG, 1CG, 1UH, 1HK, 1KN, 1QN, 1SN, 1ZN, 1HO, 1ES, 1PT, 1BW, 1VW, 1RZ, 1ACB, 1AWJ, 1ADL, 1ARY, 1BDI, 1BES, 1BDC, 1BYS, 1CAK, 1BGC, 1CCZ, 2OA, 2UA, 2WB, 2WD, 2UE, 2BF, 2BG, 2LJ, 2BK, 2TK, 2UK, 2EL, 2KL, 2TL, 2RM, 2DN, 2GR, 2RR, 2TS, 2WS, 2JU, 2RU, 2BW, 2MW, 2RW, 2ARB, 2AJF, 2AWF, 2ADL, 2AWL, 2AXL, 2AFQ, 2ABR, 2AJR, (2ACT), 2AHU, 2AJU, 2AJW, 2ARY, 2AXX, 2BBM, 2BBN, 2BML, 2BFZ, 3MA, (3OB), (3CC), 3BF, 3QF, 3ZF, 3ZG, 3IH, 3JH, 3PH, 3LL, (3FJ), (3HJ), (3SJ), (3DM), (3FM), (3TM), (3QN), 3BP, (3LP), 3BQ, 3FR, 3GR, 3FS, 3HS, (3PS), (3ZS), 3VT, (3OU), 3GV, 3IW, (3LW), 3QW, 3RW, 3VW, 3BX, (3GX), (3UX), (3WX), 3ZZ, 3BZ, (3AIA), 3ADB, 3AER, 3AFE, 3AMG, (3ADH), 3ANJ, (3AAY), 3BEV, 4EA, 4ET, (4EY), 4GL, 8DE, 8QE, 8ZA, 8BF, 8EF, 8KH, 8HJ, 8JK, 8BO, 8GO, 8XM, 8NQ, 8DR, 8TT, 8HU, 8DV, 8EV, 8KV, 8XV, 8YV, 8AW, 8FW, 8ZW, 8LX, 8DY, 8TY, 8WY, 8MZ, 8AFA, 8AJE, 8APB, 8AFD, 8AQD, 8AAE, 8AMF, 8AHH, 8AGK, 8ANK, 8AYN, 8AXO, 8AWP, 8AOT, 8AHU, 8AAZ, 8AQZ, 9ZJ, 9ZW, 9AII.

3BEK, Collegeville, Pa.—Galena

1AW, 1AX, 1BK, 1CC, 1CZ, 1EL, 1HO, 1KC, 1ADH, 1ADL, 1AEV, 1AHR, 1AJP, 1ARB, 1ARY, 1BDC, 1BDT, 1BPZ, 2BK, 2GR, 2QR, 2RX, 2UA, 3BC, 3BG, 3CC, 3DJ, 3FR, 3GR, 3GX, 3HJ, 3LF, 3LP, (3LQ), 3PW, 3QF, 3QH, 3QN, 3QW, 3RR, 3TT, 3TM, 3WT, 3XS, 3YP, 3ZO, 3ZV, 3ABB, 3ADH, (3ADO), 3AFE, (3AIA), 3AIC, 3ALI, 3ALJ, (3AQL, 3AVV, 3AWL, 3BDP, 3BER, 3BEU, 4EZ,

4GL, 8AF, 8AJ, 8AK, 8EV, 8LY, 8ML, 8OL, 8PU, 8TT, 8WY, 8AFA, 8AFU, 8AOM, 8APB, 8AWP, 8DAY, 9DJ, 9ZJ.

3AHS, Philadelphia, Pa.

1HO, 1BDC, 2BK, 2EL, 2GR, 2ZL, 3GR, 3GX, 3OU, 3TM, 3WT, 3APE, 4EY, 8AO, 8BO, 8CH, 8DE, 8EC, 8EV, 8HU, 8JL, 8KH, 8MZ, 8PC, 8RU, 8SP, 8WA, 8XM, 8XU, 8XV, 8AFD, 8AGK, 8AHH, 8AKU, 8AQV, 8ATU, 8AUB, 8AWP, 8AYN, 8BDY, 9BP, 9UU, 9AAW.

3BV, West Chester, Pa.

1DAL, 1XF, 2CC, 2DL, 2TR, 2XF, 2XJ, 3AQL, 3ACS, 3ADO, 3ALA, (3ADH), (3AUV), 3AFE, 3GX, 3ALW, 3AGN, 3BQ, 3BE, 3BG, 3CT, 3DH, 3EH, 3FM, 3GY, 3HJ, 3IJ, 3KM, 3LQ, 3OB, 3PF, 3PB, 3QN, 3QW, 3QV, 3RV, (3VR), 3VJ, 3XM, (3YP), 3ZG, 3ZF, 3ZO, 3ZS, 4EY, 8ZR, 8ACF, 8AY.

3GM, Lemoyne, Pa.

1ADL, 1AJP, 1AW, 1BDC, 1CK, 1HO, 1ZE, 2ARY, 2AP, 2AWH, 2AWL, 2BBN, 2BG, 2BK, 2DN, 2DJ, 2ED, 2EL, 2FJ, 2JU, 2RR, 2RU, 2SN, 2ZE, 2ZJ, (3ACN), 3ADB, (3AGT), 3ADQ, 3AHK, 3AOD, 3AOR, (3APB), (3AQR), (3ARJ), 3AAY, 3BER, 3BG, 3BP, 3BT, 3BV, 3BZ, 3CC, (3DM), 3ED, 3FS, 3GX, 3HJ, 3HO, 3JW, 3LP, 3QW, 3RW, 3SJ, 3UW, (3WX), 3ZO, 4EA, 4EY, 4GL, 4C.W., 4IE, 5FV, 8ACK, 8AFD, 8AGN, 8AHH, 8AIO, 8AJT, 8AL, 8AMF, 8AOT, 8APB, 8AQV, 8AWP, 8AXC, 8AY, 8BCI, C.W., 8BO, (8BJW), 8DE, 8EC, 8FT, 8HJ, 8HO, 8IQ, 8JL, 8JO, 8KH, 8LA, 8RU, 8RV, 8SFD, 8SP, 8TT, 8WA, 8XC, 8XH, 8YV, 9AW, 9ML, 9UU.

3BEC, Drifton, Pa.

1AW, 1BB, C.W., 1BK, 1BM, 1BP, 1CF, 1DH, 1ES, 1FF, C.W., 1HO, 1OE, 1PT, C.W., 1QN, C.W., 1RZ, 1AGL, 1ANQ, 1AGL, 1ARY, 1BDC, 1BPZ, 1CAK, 1CCZ, 2BE, 2BG, 2BK, 2DN, 2EL, 2FG, 2FS, 2GL, 2GR, 2JU, 2KL, 2NF, 2OA, 2RR, 2RU, 2QF, 2WD, 2WI, 2XK, 2XL, 2XM, 2XN, 2ZL, 2ZV, 2ACT, 2ACT, 2AFZ, 2AJF, 2AJU, 2AJW, 2ARY, 2ARB, 2AWK, 2AWL, 2AXB, 2BBN, 2BIW, 2BFZ, 2BRB, 2BYZ, 3AW, 3CC, 3DS, 3EF, 3FS, 3GX, 2HJ, 3HX, 3IW, 3IX, 3KL, 3KM, 3KU, 3OU, 3QR, 3RM, 3UF, 3V, 3VW, 3XF, 3ZO, 3ZY, 4GL, 5OA, 8AP, 8BO, 8CF, 8DE, 8DR, 8EC, 8EV, 8FX, 8GO, 8GR, 8HU, 8HY, 8IL, 8IV, 8JM, 8JQ, 8KH, 8LX, 8ML, 8MM, 8MQ, 8NQ, 8OV, 8OW, 8RU, 8SP, 8SE, 8TJ, 8TT, 8TY, 8UA, C.W., 8WY, 8VS, 8XM, 8XV, 8ZD, 8ACF, 8ADL, 8AFD, 8AGK, 8AHH, 8AIO, 8AND, 8AQA, 8AJP, 8AJT, 8AOT, 8APK, 8ARK, 8AVS, 8AVT, 8AWP, 8AXC, 8AYN, 8BCI, 9AAW, 9ACO, 9AZX, 9AW, 9DXM, 9UH, 9ZJ, Canadian 3BP.

4DH, LaGrange, Ga.

1MAD, 2EL, 3V, 4AG, 4BK, (4BY), 4BQ, (4FD), (4GN), (4GL), (4IE), 4XK, 5DA, 5ER, (5FV), 5HV, 5ER, 8SP, 8TT, 8AFA, 8AFD, 9UH, 9UU, 9AKC.

4GM, Atlanta, Ga.

3DD, 3IW, 3AWL, 4AG, 4BE, 4BK, (4BY), 4DH, (4FD), (4GL), 5BV, 5DW, 5EK, 5ER, (5HV), 5KK, 5TS, 8AL, 8AM, 8BT, 8DE, 8EV, 8EZ, 8IL, 8IW, 8FT, 8NG, 8PO, 8SP, 8TT, 8WY, 8ANK, 8AFD, 8AXC, 8BBU, 8LFB, 9AN, 9DZ, 9IS, 9FR, 9ME, 9MK, 9SR, 9US, 9UU, 9VL, 9VZ, 9X1, 9ZN, 9AIR, 8ATY.

4II, Orlando, Fla.

4AG, 4BC, 4BK, 4FD, 9ZS, 9ZN, —C.W.: 2ZL, 2ZV, 3BZ, 3ZO, 3ZY, 4BY, 4GL, 4ZE, 8LX, 8ZG, 9FW.

4EY, Elizabeth City, N. C.

1BDC, (1GM), 2AJW, 2BFC, 2DN, 2EL, 2OM, (2FF), (2XF), 2ZV, 3AWP, (3BG), 3BZ, 3GX, (3QF), 3XF, (3ZO), (3ZY), 5DA, (8BO), 8DE, (8ZD).

4XC, Atlanta, Ga., July 20—Aug. 20.

2AJF, 2AWL, 2ARY, 2EL, 2ZV, 3BZ, 3ZY, 4BK, 4BY, 4DH, 4DT, 4FD, 4GN, 4IE, 4GL, 5DA, 5EK, 5ER, 5FV, 8AFB, 8AFD, 8AFS, 8ACD, 8AGK,

8AIO, 8AKS, 8ANK, 8AS, 8AVO, 8AYN, 8AXC, 8BO, 8DE, 8EZ, 8HA, 8IV, 8JQ, 8LX, 8NQ, 8OI, 8OW, 8WY, 8XM, 9ACB, 8ALB, 9AQM, 9FW, 9GO, 9GS, 9KO, 9MC, 9NQ, 9ME, 9UH, 9UU, 9UW, 9VC, 9VL, 9WZ, 9XM, 9ZN.

5NH, Rockdale, Tex.

5CP, (5KP), (5LM), 5MX, 5NS, 5NZ, 5PK, (5PP), 5QY, 5RA, 5XI, 5YK, 5ZC, (5ZF), (5ZU), (5ZX), (5ZAF).

5HZ, Houston, Tex.

4GL, 5AO, 5BI, 5AF, (5DW), (5EK), 5EW, (5FA), (5HL), 5HV, 5JR, (5KP), (5KV), (5LC), 5LM, 5NP, 5NH, (5NI), (5NS), (5NC), 5PP, (5MX), 5QQ, (5QS), (5QY), 5RA, (5SC), (5ZAF), 5'S, (5ZU), (5XI), (5XJ), 5YK, 9AIO, (9AEG), 9AJW, (9DUG), 9UG, 9MC.

5ZAF, Waco, Texas, July 15 to August 22

(5CC), (5CI), 5DW, (5EW), (5FA), (5FE), (5GG), (5HF), 5HL, 5HV, (5HZ), (5IQ), (5IR), (5IX), (5IF), 5IE, (5JA), (5JL), (5JX), (5KK), (5KP), (5KV), (5LC), (5LM), (5MM), (5MX), (5NH), (5NC), (5NF), (5NS), (5OR), (5PP), (5RS), (5YK), (5XI), (5XJ), (5ZAG), (5ZC), (5ZF), (5ZU), (5ZX), (9AEG), 9EL, 9EW, 9DUG, 9DUO, 9OE, 9OI, 9PS, 9ZN.

Notice to 4's, 5's, 6's and 7's

Altho swamped with calls from other districts the few lists appearing here from your districts comprise every August report sent in. If you want better representation in QST, send in your lists.—Ed.

6OC, San Francisco, Aug. 31—Sept. 12

(6EA), (6EN), (6FH), 6FK, (6GF), (6GI), (6GR), 6HY, (6IC), (6IS), 6KA, (6KC), 6LC, (6MH), 6MN, 6OD, (6OH), (6WH), 6ABG, (6ACR), 6ACY, (6ADL), 6AEI, (6AEW), 6AID, (6ALE), 6ALU, 9APE, (6AAU), 6AVB, 6ZN, 6ZU, (7BP), 7ED, 7IU, 7KJ, (7OZ), 7XD, (7ZJ), (7ZT).

6ALE, Reedley, Cal.

5ZA, 6DS, (6EN), (6EX), (6HP), (6KP), (6MH), (6OH), (6PJ), (6TV), (6WZ), 6XD, 6ZN, 6ZX, (6ALU), (6AMW), 6APH, (6AUL), 6ZAE, (6ZAD), 7BK, 7ED, (7KM), (7MF), (7ZJ).

7OZ, Eugene, Oregon

6AC, 6AE, 6BK, 6CK, 6CH, 6CV, 6DP, 6EA, 6EB, 6EP, 6EX, 6FH, 6FT, 6GF, 6HP, 6IC, 6KA, 6KM, 6KY, 6LC, 6TV, 6ZX, 6ZAE, 6AAW, 6ABW, 6AEM, 6ADL, 6ACR, 6AJH, 6AD, 6ALA, 6ALE, 6AMW, 6AGN, 7AY, 7BC, 7BH, 7BK, 7CB, 7CC, 7CN, 7ED, 7GA, 7IN, 7IU, 7IY, 7KB, 7KJ, 7KM, 7LS, 7NI, 7NW, 7QQ, 7XF, 7UZB, 7ZJ, 7ZN, 7ZS, 7ZT.

J. E. Law, Jr., Cheat Bridge, W. Va.

1CF, 1HO, 1PT, 1SN, 1TS, 1ADL, 1BDT, 1CAK, 2BG, 2DA, 2DN, 2EL, 2GR, 2JW, 2KL, 2OM, 2XK, 2WD, 2AHU, 2AJF, 2AJW, 2ARY, 2AWL, 2BBN, 2BFZ, 2BGH, 2BZ, 3CC, 3GX, 3HB, 3HJ, 3HX, 3IW, 3KM, 3LI, 3LP, 3OU, 3QF, 3UC, 3VV, 3XF, 3YQ, 3ZF, 3ZO, 3ZY, 3AAV, 3ACT, 3BFV, 3AQR, 4BQ, 4FD, 4IE, 4GL, 5DA, 5XK, 5BN, 5BO, 5BT, 5CF, 5DE, 5DR, 5DV, 5DJ, 5EA, 5EC, 5EZ, 5GO, 5HA, 5HJ, 5IL, 5IV, 5JJ, 5JM, 5JQ, 5JU, 5LW, 5LX, 5NQ, 5OI, 5OW, 5PM, 5PT, 5PW, 5QY, 5RU, 5RV, 5SJ, 5SP, 5TK, 5TT, 5TY, 5UG, 5UP, 5VE, 5WB, 5WU, 5WY, 5WZ, 5XM, 5YV, 5ZA, 5ZD, 5ZV, 5AAZ, 5ABP, 5ACD, 5ACP, 5ACS, 5AFB, 5AFG, 5AGK, 5AHH, 5AIB, 5AIO, 5AKH, 5AKW, 5AMF, 5AML, 5AMM, 5ANK, 5ANO, 5AOI, 5APB, 5AQZ, 5ARD, 5ARS, 5ARU, 5AVT, 5AWP, 5AWX, 5AXC, 5AYN, 5BBU, 5BCI, 5BDY, 5BEN, 5BFV, 5BP, 5FS, 5FW, 5GX, 5JR, 5KO, 5MC, 5ME, 5PF, 5UF, 5UH, 5VL, 5ZB, 5ZJ, 5ZN, 5ZR, 5AAP, 5AAV, 5AAW, 5AAV, 5AFF, 5AFK, 5AGG, 5AMP, 5AMT, 5AQM, 5AZX.

Camp Dudley Station—Westport-on-Lake-Champ-lain, N. Y.—July 10—Aug. 16.

1AD, 1AAU, 1ADO, 1ADL, 1ARK, 1ARY, 1AW, 1AZJ, (1AZX), (1BHC), 1BDI, (1CAK), 1CK, 1CZ, 1DY, 1ES, 1FF, 1MC, 1OE, (1PT), 1QR, 1RZ, 1TS, 1ZE, 2AD, 2AE, 2ABG, 2ADS, 2AJW,

2AJF, 2AEF, 2AWF, 2AWL, 2AXX, 2BB, 2BBN, 2BD, 2BG, 2BFZ, 2BSC, 2BGH, 2BTA, 2DA, 2DI, 2DN, 2DJ, 2EL, 2FS, 2IQ, 2IU, 2JJ, 2JN, 2OM, 2RR, 2RU, 2UA, 2WB, 2WI, 2WM, 2XK, 2XJ, 2ZL, 2ZR, 2ZN, 3AQR, 3BZ, 3CC, 3DJ, 3JO, 3HX, 3NB, 3OU, 3VV, 3XZ, 3ZO, 3ZV, 4GL, 4BY, 4XC, 5IS, 5XB, 5ABK, 5ACF, 5AEX, 5AFA, 5AFD, 5AHH, 5AHS, 5ALO, 5AIO, 5AJT, 5AKQ, 5AOT, 5AQV, 5AQX, 5AQZ, 5AYM, 5AYN, 5AKS, 5AXC, 5AWP, 5BB, 5BT, 5BOC, 5CP, 5DE, 5FP, 5HL, 5HP, 5JJ, 5JM, 5LY, 5OI, 5OW, 5PW, 5QM, 5RU, 5SP, 5TT, 5XM, 5WY, 5XU, 5YV, 5ZL, Canadian 2BF, 2CI.

5BJQ, Buffalo, N. Y.—Galena

1ARY, 1BDT, 1ARY, 2ARY, 2BK, 3EL, 3IL, 3IW, 3LI, 3JU, 3QF, 3ACF, 3AFD, 3ARK, 3AYS, 3AHH, 3AJT, 3AMF, 3AQV, 3AWT, 3AYH, 3AXC, 3AYN, 3BA, 3BDY, 3BDH, 3EV, 3HB, 3HG, 3ID, 3IT, 3KH, 3MM, 3OI, 3PE, 3RU, 3SP, 3ST, 3TK, 3TY, 3AAW, 3AW, 3ML, 3MC, 3PC, 3PQ, 3WO, 3ZN, 3ZJ.

8AFA, Rochester, N. Y.

1AW, 1BDC, 1GW, 1HO, 1SN, 1TS, 2AJB, 2AWL, (2ARY), 2BFZ, (2BK), 2BM, 2DA, (2EL), 2GR, 2JU, 2WB, 3AOV, 3AQR, 3AWH, 3BP, 3CC, (3IW), 3OU, 4GL, 5DA, 5FV, 5ZAA, 5ACF, 5AFB, (5AFD), (5AFE), 5AGL, 5AGK, 5AHH, 5AIG, (5AJT), 5AMF, (5ANK), (5AOI), 5AOT, 5APB, (5AQV), 5ARD, 5ARS, (5AVT), (5AWY), 5AYS, (5AYN), 5BDP, (5BDY), 5BP, 5CI, (5DE, C.W.), (5EV), 5HB, 5ID, 5IL, 5JU, 5KH, (5MM), 5PU, 5QH, 5QY, 5RU, (5SH), 5SP, 5TT, 5TW, (5TY), 5UP, 5VQ, 5WA, 5ZD, 5FS, 5UH, 5ZN.

8BIP Syracuse, New York.

1BK, 1BO, 1BY, 1QN, 1RZ, 1TB, 1UL, 1XE, 1BAP, 2AJ, 2BK, 2CC, 2CO, 2DA, 2DL, 2HJ, 2HL, 2HO, 2JU, 2BL, 2LV, 2PL, 2QL, 2XA, 2XX, 2ZH, 2AQR, 2AJF, 2ARB, 2ARC, 2ARY, 2AWL, 2BBN, 2BDH, 3BZ, 3CY, 3DV, 3GK, 3LA, 3LP, 3LV, 3ZO, 3AAE, 4GC, 4GL, 5AQ, 5LA, 5JA, 5AG, 5AR, 5AY, 5BC, 5CF, 5DE, 5DR, 5EC, 5EJ, 5IU, 5MC, 5NQ, 5OI, 5QK, 5QR, 5QY, 5RP, 5SP, 5WR, 5XM, 5ZA, 5ZL, 5ZN, 5AHH, 5AJT, (5AKA), 5AKW, (5ANQ), 5APB, 5AQZ, 5ARK, 5AWA, (5AWP), 5AXC, (5AXI), (5BJI), 5BKK, 5AT, 5AX, 5ED, 5LJ, 5ZJ, 5ZL.

8OA, Barnesville, O.

Spark: 1AW, 1BDC, 2AHK, (2ARY), 2BG, 2EL, 2KM, 2OM, 2WB, 3BP, (Canadian), 3CC*, 3GO, 3IW, 3KM, 3OU, 4BQ, 4BX, 4IE, 5DA, 5EK, 5FV, 5AAV, (5ACF), 5ACO, 5ADO*, 5AFB, (5AFD), 5AFQ, 5AFS, 5AGK*, 5AHH, 5AHL, 5AHY, 5AJB, 5AJT, (5AJV), 5AKJ, 5ANO, 5AOI, (5AQV), 5ASU, 5AVT, 5AVO, (5AWP)*, 5AWZ, (5AXC), (5AYN)*, 5AYS, (5BO), 5BDY, 5BEN, 5BK, (5BKN), 5BGF, 5BML, 5BBU, 5BDP, 5BP, 5CH, (5DJ)*, 5DK, (5EZ), (5EA), 5EO, 5EB, 5EC, (5EF)*, 5EV, 5FA, 5FO, 5GW, 5HA, 5HB, 5HG, 5HU, 5IJ, 5JL, (5MM), 5ML, 5NL, 5LW, 5OI, 5QY, 5QM, 5RE, 5RU, 5SP, 5TT, 5TK, 5TY, (5WA), 5WY, (5WZ), 5YV, 5ZA, 5ZD*, (5ZT), 5ZN, 5AAW, 5AAV, 5ACB, (5AFK), 5AGG, 5AMT, 5AQM, 5AZA, (5AWZ), 5BP, 5CP, 5DSL, 5DTJ, 5DWM, 5DXM, 5GX, 5HM, 5KO, 5LQ, 5ME, 5MC, 5PN, 5QH, 5UU, 5UW, 5WJ, 5VL, 5YA, 5YAC, (5UH), 5ZN, 5ZL, 5ZJ.

C.W.: 1CWA, 2AJF*, 2AJW*, 2AWL*, 2BK, 2BFZ*, 2DN, 2EL, 2GR, 2FS, 2PS, 2RR, (2XK)*, 2ZL, 2ZV*, (3BZ)*, 3CT, 3VV*, 3ZY*, 4GL*, 4ZE, 5AAZ, (5ACT), 5AFO, 5AIO*, 5AJP, 5AKH, (5AKS), (5AK), 5ALW, 5ANK, (5AQZ), 5AYW, 5BCI, 5BDU, 5BJZ, 5BM, 5BT, 5CF, 5DE*, 5DR, 5DV, 5FB, 5FD, 5GE, 5GW, 5HA, 5H, 5IV, (5JM), 5JB, 5JQ*, 5JU, 5LX*, 5OW, 5PN, 5PT, 5QI, 5QY, 5UC, 5XM, 5WR, 5WY, 5XK, 5YV, 5ZY, 5AAV, (5AZX), 5FW.

Stations marked with * were copied without either aerial or ground.

J. E. Phillips, Cleveland, O.

C.W.: 1CAK, 2CC, 2GR, 2KL, 2XK, 2ZQ, 2ZL, 2ZV, 2AJW, 2AWL, 3VV, 4GL, 5BL, 5BK, 5DE, 5DR, 5GY, 5HA, 5IV, 5JU, 5ML, 5NQ, 5QY, 5UK, 5ZB, 5ZY, 5ACR, 5AFO, 5AJP, 5AMM, 5AWF, 5BCA, 5BEF, 5BGD, 5FW, 5ALY, 5AL Canadian.

Spark: 2MM, 2BP Canadian, 3OU, 8AY, 8BK, 8CD, 8CU, 8EA, 8FO, 8GL, 8GY, 8IG, 8JG, 8JL, 8MJ, 8ML, 8MM, 8OI, 8RP, 8TC, 8TF, 8TJ, 8TT, 8TZ, 8UC, 8UH, 8UK, 8WA, 8YN, 8ZP, 8ACP, 8ACH, 8ADO, 8AGT, 8AIB, 8AJO, 8ANO, 8AQD, 8AQV, 8ARD, 8ARF, 8ASF, 8AUL, 8AVT, 8AWK, 8AWT, 8AXC, 8AYN, 8AYR, 8AYS, 8BAH, 8BCD, 8BCO, 8BDV, 8FS, 8ME, 8UH, 8UW, 8ZN, 8AAW.

8BBU, Columbus, Ohio

Spark: 1AW, 1BDC, 2AR, 2BK, 2CC, 2DN, 2EL, 2GR, 2HX, 2WB, 2WL, 2ZK, 2AQR, 2ARY, 2BPM, 3AC, 3BF, 3BZ, 3CC, 3HC, 3HG, 3HJ, 3HY, 3IW, 3KM, 3OW, 3SK, 3VV, 3XF, 3XW, 3AAO, 3AHK, 3AQR, 3ASP, 4AG, 4BQ, 4FV, 4IE, 4XK, 5DA, 5EB, 5FV, 5YH, 5AB, 5AE, 5AY, (8BO), 5BP, 5BR, 5CD, 5CH, 5CL, 5CJ, 5CP, 5DJ, 5DL, 5DP, 5DV, (8DZ), 5EA, (5EB), 5EG, 5EV, (5EZ), (5FT), 5GB, 5GO, 5HB, (5HU), 5ID, 5JL, 5KH, 5MC, 5MJ, 5MM, 5MS, 5NL, 5NO, 5NZ, (8OA), (8OI), 5PA, 5PM, 5PW, 5RP, 5RQ, 5RS, 5RU, 5SP, (8TK), 5TN, (8TT), 5TY, 5UC, 5UJ, 5UP, 5VE, (8WA), 5WM, 5WU, 5WY, (8WZ), 5YM, 5YR, 5YV, 5YW, 5ZD, 5ZN, 5ZT, 5ZW, 5ZY, 5ZAA, 5ACD, 5ACF, 5ACO, 5ACS, (5ADE), 5ADO, (5AEE), (5AER), 5AEY, 5AFA, 5AFB, 5AFC, 5AFD, 5AFO, 5AFS, 5AGK, 5AHH, 5AHY, (5AIB), 5AII, (5AJE), 5AJT, (5AJX), 5AKH, 5AK, 5AKO, 5AKR, 5AKS, 5AKV, 5ALG, 5ALH, 5AMI, 5AMJ, 5ANB, 5ANO, 5ANP, (5ANY), 5APR, 5ARD, (5ARS), 5ASZ, 5AUN, 5AWP, 5AWQ, 5AWV, 5AWX, 5AWZ, (5AYN), 5AYS, 5BCO, 5BDO, 5BDW, 5BDY, 5BEG, (5BEN), 5BEP, (5BGF), (5BHO), 5BHR, 5BHV, (5BIS), (5BIT), (5BMW), (5BNA), 5BSZ, 5ZAA, 5BP, 5CP, 5DX, 5FC, 5FG, 5FS, 5GC, 5GO, (5GX), (5HM), 5HR, 5JG, 5JQ, 5KO, 5LQ, 5MC, 5ME, 5MK, 5NQ, 5NY, 5PC, 5PY, 5UF, (5UH), 5UK, (5UU), 5UW, 5VK, (5VL), (5VZ), 5WO, 5WP, 5XD, 5ZC, 5ZJ, 5ZL, (5ZN), (5AAW), 5AAJ, 5ACF, 5ACY, 5AFF, 5AGG, 5AGQ, 5AII, 5AIR, 5ALH, 5AMS, 5AMT, 5ANC, 5ANG, 5APS, 5AQM, 5ARK, 5AWY, 5AWZ, (5AZX), 5DAX, 5DTJ, (5DWM), 5DWU, 5DXM, 5UTL.

C.W.: 1AZJ, 1BDC, 2DN, 3FP, 2GR, 2KL, 2RR, 2AGW, 2ARY, 2AWL, 2BFZ, 3VV, 3AAO, 3ABI, 4GL, 5MA, 5AJ, 5BT, 5CC, 5CL, 5DE, 5HA, 5HJ, 5IL, (5IV), 5JM, 5JU, 5LX, 5OO, 5OW, 5QY, 5RQ, 5VS, 5WR, 5WY, 5XH, 5XK, 5XM, 5XV, 5ZR, 5ZU, 5ZW, 5AFO, 5AIK, 5AIO, 5AJP, 5AKS, 5ANK, 5AQZ, 5AW, 5AX, 5FW, 5ALB, 5AVC, (5AZX).

8TT, Painesville, Ohio

1TS, 1COK, 1XE, (2WB), 2AJF, (2ARY), (2AWL), (2BFZ), (2ZL), 3GX, 3XF, 3BFZ, (3BP Canadian), (4EA), (4GL), 4GX, 4IE, (5FV), (8BO), (8EV), (8LX), (8SP), 8TY, 8ZY, (8AGO), 9FC, (9FS), (9ME), (9MS), (9UH), (9UU), (9ZL), (9ZN), (9AAW), 9AWZ.

8AJE, Delaware, Ohio

1CAK, 1HO, 1RU, 2AWL, 2EL, 2BFG, 3AJ, 3BK, 3CD, 3CC, 3HR, 3IW, 3UC, 3VV, 4IE, 4GL, 5DA, 5FV, 5AAZ, 5ACY, 5AFB, 5AFD, 5AGK, 5AHH, 5AIB, 5AIO, (8AJK), 8AJT, 8ALY, 8AMJ, (8ANO), 8ANY, (8AOI), 8APP, 8AQV, 8AGZ, (8AVO), (8AWU), 8AXC, 8AYW, (8BBU), 8BDO, (8BEN), (8BGF), 8BHE, 8BHV, 8BIB, (8BKJ), 8BMW, 8BVR, 8DE, 8DJ, 8DR, 8DV, 8AC, 8EG, 8EV, 8EZ, 8GO, 8HG, 8IU, 8IV, 8JM, 8LQ, 8NQ, 8OI, (8OO), 8OW, 8QH, 8SP, (8TJ), 8TO, 8UP, 8WA, 8WF, 8WR, (8WZ), 8XB, 8XM, 8YM, 8YV, 8ZAA, 8ZN, 8ZR, 9AAW, 9AAJ, 9ABH, 9AGG, Canadian 9AL, 9ALK, 9AJW, 9APS, 9AYW, 9AZX, 9DAX, 9DXM, 9DWM, 9FS, 9GX, 9ME, 9MC, 9UH, 9UU, 9UW, 9VK, 9ZH, 9ZJ, 9ZL, 9ZN.

8AJH, Mariette, Mich.

1AW, 1RU, 1ANQ, 1CAK, 2AB, 2BN, 2CC, 2EL, 2GR, 2OL, 2RR, 2RY, 2XK, 2ZL, 2ZN, 2ZO, 2ARY, 2AWL, 2BDN, 2BFZ, 2BUL, 3BZ, 3CC, 3EH, 3NB, 3ND, 3VV, 3YK, 3ZO, 3XK, 4BQ, 4BY, 4GL, 4IE, 5GE, 5WU, 6EA, 6TV, 8AY, 8BA, 8BD, 8BI, 8BO, 8BP, 8BW, 8BB, 8BJ, 8CN, 8CP, 8DE, 8DJ, 8EA, 8FE, 8DR, 8HC, 8HJ, 8HH, 8HQ, 8HA, 8IL, 8JU, 8JM, 8KH, 8KK, 8LX, 8LQ, 8MM, 8OI, 8PO, 8OW, 8QY, 8RU, 8RQ, 8ST, 8TT, 8UX, 8WA, 8WY, 8XM, 8XS, 8ZA, 8ZD, 8XD, 8WO, 8ZP, 8ZY, 8ZW, 8ADY, 8ACF, 8ZU, 8AFB, 8AFD, 8AFG, 8AGY,

8AGK, 8AGG, 8AHH, 8AIB, 8AIO, 8ADO, 8AJK, 8AKH, 8ALY, 8AMZ, 8AQZ, 8AYH, 8AYN, 8BCL, 8BEC, 8BEP, 8BGH, 8BGM, 8BHO, 9AZ, 9BP, 9FA, 9FQ, 9FW, 9GH, 9KO, 9MC, 9ME, 9MS, 9LQ, 9NQ, 9OR, 9PN, 9ST, 9UH, 9UW, 9UU, 9VK, 9WO, 9WW, 9WZ, 9ZB, 9ZL, 9ZO, 9ZY, 9HP, 9AAC, 9AAW, 9ZN, 9AEG, 9ACL, 9ACM, 9AZZ, 9AZX, 9DKS, 9VL, 9DEH, 9DXM, 9DXG.

8EA, Detroit, Mich.

2BP, 2DP, 2ED, 2QH, (2ARY), 2AWI, 3HJ, (3IW), 3KM, 3QF, 3QF, 4EA, 5EK, 5FV, 8AL, 8AV, 8AY, 8BR, (8CG), 8IV, 8JG, 8JE, 8EB, 8EV, 8EZ, (8FE), 8FS, 8ML, 8MM, 8NG, 8NZ, (8OA), (8OI), (8RU), (8SP), (8TJ), 8TK, (8TT), (8TY), 8UC, 8UP, 8WL, 8WO, 8WY, (8WZ), 8ZB, 8ZD, 8ACD, 8ACN, 8ACY, 8ADO, 8ABD, (8AFS), 8AFX, (8AGK), (8AHH), 8AHY, (8AIB), 8AIO, 8AIV, (8AJT), 8AKD, 8AMT, (8ANO), 8AQD, 8ARS, 8ASH, (8AWP), 8AXC, 8AYN, 8AYS, 8BBU, 8BBY, 8BCL, (8BDY), 8BDU, 8BEN, 8BHY, 8AVO, 9AE, 9AW, (9BP), (9CP), 9EF, 9FC, 9FO, 9FS, 9GK, 9GP, 9GX, 9HM, 9KO, 9MC, 9ME, 9MF, 9MK, (9PC), 9RS, 9UF, (9UH), 9UU, 9VQ, (9VZ), 9ZJ, 9ZL, 9ZN, 9AAW, 9AFK, 9AFM, 9AFS, 9AFX, 9AGG, 9AMS, 9AMT, 9ANX, 9AVO, (9AWU), 9AZG, 9AZX, (9DWM), 9DXM.

8ALW, Washington, Pa.

1CAK, 1AYQ, 1HO, 1RZ, 1ZV, 1BDC, 1BWK, 1CCZ, 2ADL, 2AWL, 2EL, 2BBN, 2BK, 2XX, 2XK, 2BFZ, 2ZL, 2XF, 2OM, 2WL, 2WB, 2AJF, 2BT, 2RU, 2QF, 2JU, 2AJW, 2RR, 2GR, 3IW, 3ZW, 3HJ, 3AHK, 3AAE, 3BZ, 3OU, 3XK, 3ZY, 3HB, 3VX, 3HX, 3CC, 3BP, 3AQR, 3XF, 4BQ, 4IE, 4GL, 4GV, 4ET, 4ZL, 4EY, 5DA, 5ZA, 5YH, 5FV, 8BDU, 8AKJ, 8WY, 8AGK, 8AYN, 8OW, 8YV, 8NL, 8AJF, 8BT, 8BO, 8OI, 8BDY, 8AHH, 8ACS, 8EZ, 8AVT, 8IL, 8TT, 8DE, 8BEN, 8JB, 8QY, 8NU, 8IV, 8HJ, 8AVO, 8ADO, 8ED, 8AYW, 8AQV, 8SP, 8FA, 8AMR, 8XV, 8AYS, 8BJZ, 8WR, 9GO, 8GA, 8OW, 8CF, 9UH, 9FS, 9VK, 9UU, 9AAW, 9AGG, 9PC, 9AAJ, 9EG, 9MC, 9DOI, 9AQF, 9MK, 9ZJ, 9AEG, 9HR, 9AUF, 9AZX, 9AAV, 9ZN, 9AL, 9ALB, 9AKL, 9GX, 9ALH, 9ABH, 9PV, 9AMS, 9AW, 9HM, 9ME.

Ex-8AKH, Vandergrift, Pa.

Spark: 2ARY, 2BK, 2GR, 2UA, Can. 3BP, 3IW, 3OU, 3VW, 3XF, 5FV, (5ACF), 8AFD, 8AGK, 8AGX, 8AHH, 8AHU, 8AIG, 8AIN, 8AMT, 8APP, 8AQV, 8AVO, 8AVT, 8AWP, 8AXC, 8AYN, 8BBU, 8BO, 8CF, 8DV, 8EF, 8ID, 8KK, 8MM, 8NO, 8OI, 8RU, 8SP, 8TT, 8TY, 8UP, 8YV, 8ZD, 9AAP, 9AAW, 9AAJ, 9ABH, 8ACY, 8AJW, 9BP, 9CP, 9FS, 9HM, 9KO, 9PN, 9QH, 9UH, 9UU, 9UW, 9ZL, 9ZN.

C.W.: 1CAK, 2AJF, 2AWL, 2BFZ, (2DN), 2KL, 2XK, 3ER, 3VV, 4GL, 8AIO, 8AJF, 8BT, 8DE, 8IL, 8IV, 8JM, 8LX, 8NO, 8PN, 8QY, 8XV, 9FW.

9AHC, Ellendale, N. Dak., July and Aug.

Spark: Canadian 3BP, 5EK, 5FO, 5JR, 5LC, 5QL, 5YH, 7MO, 7XD, 7ZO, 8KH, 8AFB, 8AGK, 9AAP, 9AAW, 9ABH, 8ACB, 9AEG, 9AEY, 9AFK, 9AFX, 9AIF, 9AKC, 9AKX, 9AMS, 9ANF, 9ANN, 9AOU, 9AP, 9APN, 9AQM, 9ARF, 9ARZ, 9ASF, 9ASK, 9AXU, 9AYW, 9AZA, 9BP, 9CP, 9DJZ, 9DNC, 9DUG, 9DWL, 9DXM, 9EL, 9FQ, 9FS, 9GC, 9HM, 9IL, 9KO, 9LC, 9LF, 9MC, 9MS, 9OE, 9OO, 9PI, 9UU, 9VK, 9WL, 9YAC, 9ZC, 8ZJ, 9ZL, 9ZN.

C.W.: 2AWL, 5DW, 5HL, 5ZA, 7HW, 8CF, 8DE, 8HA, 8IL, 8IV, 8JQ, 8LX, 8NK, 8NK, 8OW, 8QY, 8RT, 8AIO, 8ANK, 8ABU, 9AG, 9AJA, 9ALB, 9AMB, 9AZX, 9DYG, 9EK, 9YY, 9XM.

9AOG, Lawrence, Kansas

4ZL, 5DW, 5EK, 5FV, 5HL, 5HV, 5HZ, 5JA, 5JR, 5KV, 5LC, 5NK, 5QL, 5ZA, 8DE, 8IV, 8JM, 8NQ, 8NR, 8OI, 8TT, 8WA, 8WY, 8WY, 9ABH, 9AEG, 9AEQ, 9AFK, 9AJW, 9AKC, 9ALB, C.W., 9ALG, 9AMD, 9AMS, 9ANQ, 9ANF, (9AOD), 9AOJ, 9AQM, 9AQR, 9AW, 9ARP, 9ARZ, 9ASD, 9AVK, 9AVM, 9AVN, 8AXJ, 9AYA, 9AYW, 9AZA, 9AZX, 9BP, 9DEH, 9DFL, 9DJZ, 9DJX, 9DPE, 9DSG, 9DUG, (9DVF), 9DXM, 9DYA, 9EL, 9FQ, 9GS, 9HM, 9HP, 9KO, 9LA, 9MC, 9OO, 9PC, 9PN, 9PS, (9QO), (9RB), 9RV, 9SM, 9TY, 9UF, 9UU, 9VR, 9WL, 9WZ, 9XAB, 9ZAD, 9ZB, 9ZC, 9ZJ, 9ZN.

9DZI, Columbia, Mo.

9ASS, 9PIA, 9MW, 9ANO, 9KL, 9ANZ, 9ANV, 9ACZ, 9AAW, 9LA, 9LC, (9ZB), 9AEQ, 9DNY, 9AXJ, 9AAU, 9AKC, 9AMV, 9ME, 9AJW, (9DYA), 9ACN, 9ZN, 9GX, 9YO, 9MC, 9ZAD, 9WI, 9AQM, (9AVH), 9ABH, 9AEG, 9ARZ, 9UU, 9AMS, (9YM), 9AMS, 9OO, 9SL, 9JG, 9JK, 9AEF, (9AOJ), 9DSL, 9DPH, 9DNF, (9DAZ), 8DE, 5LC, 5EK, 5XL.

9ARZ, Clear Lake, Iowa

(5EK), 5ER, 5EW, 5NS, 5DE, 9JM, 9LS, 8MM, 8OJ, 8TK, 8ZB, 8AFB, 8AFD, 8AGK, 8AIB, 8AIO, 8AMK, 8ANK, 8ATW, 8AYN, 8BEP, 8NQZ, 9AC, 9AL, 9BP, 9CS, 9EL, (9FS), 9FL, 9FY, 9GC, 9GG, 9GP, 9GS, 9GX, 9IY, 9KP, 9MC, 9ME, 9MG, (9MS), 9NQ, 9NX, (9OO), 9PL, 9TH, 9UA, 9UU, 9VE, 9VK, 9VL, 9VY, 9VZ, 9WZ, 9XM, 9YA, 9YY, 9ZA, 9ZJ, 9ZL, 9ZN, 9ZU, (9AAE), 9AAP, 9AAW, (9AAV), 9ABH, 9ACB, 9ACN, 9AEG, 9AEQ, 9AFF, (9AFK), 9AFQ, 9AFL, (9AFW), 9AJW, 9ALO, 9AMB, 9AMK, (9AMI), (9AMU), 9ANM, (9AOU), (9ARA), 9ARV, 9ASN, (9ATN), 9AZP, (9AXU), 9AYG, 9AYN, (9AYW), 9AZA, 9AZX, 9BAL, (9DBL), (9DCV), 9DEH, 9DFL, 9DHA, (9DKF), 9DKY, (9DUG), 9DVO, 9DWZ, (9DXU), 9DYA, 9DYE, (9DYI), 9DYT, 9DZA, 9YAC, (9YAE).

9DMA, Caledonia, Minn.

2AFK, 4GL, 5EK, 8BO, 8DE, 8DR, 8EA, 8II, 8IV, 8LX, 8MM, 8OI, 8OW, 8QE, 8RQ, 8TK, 8TT, 8WA, 8WY, 8XM, 8YF, 8ZN, 8AFD, 8AFS, 8AGK, 8AIC, 8AID, 8AIO, 8AYN, 8EMI, 9AE, 9BP, 9CP, 9FS, 9FW, 9HM, 9IY, 9KO, 9ME, 9MO, 9MS, 9NQ, 9OE, 9OO, 9PC, 9PN, 9PS, 9UH, 9UU, 9UV, 9VL, 9WN, 9XI, 9XM, 9ZJ, 9ZN, 9ZO, 9ZU, 9AAW, 9ABU, 9ABH, 9ACN, 9ACW, 9AEG, 9AFF, 9AFK, 9AFX, 9AIU, 9AJB, 9ALB, 9ALH, 9AMS, 9AMT, 9ANC, 9ANJ, 9ANO, 9ANR, 9APN, 9AQM, 9ARZ, 9ATN, 9AWE, 9AWZ, 9AYW, 9AZF, 9COE, 9DAX, 9DEH, 9DKL, 9DKR, 9DOW, 9DUG, 9DXM, 9GTG, 9YAC, 9XAC.

9APS, Covington, Ky.

1BD, 2BL, 2EL, 2GR, 2OU, 2WB, 2ABM, 2AWL, 2BFG, 2BP, 3BZ, 4AL, 4BQ, 4FD, 4GL, 4GX, 5DA, 5FV, 5XK, 8BO, 8BX, 8CF, 8CH, 8CP, 8DE, 8EA, 8EN, 8EV, 8EX, 8FE, 8GS, 8HG, 8ID, 8II, 8JM, 8MI, 8MY, 8OI, 8PB, 8RM, 8RN, 8RY, 8SP, 8TJ, 8TO, 8TT, 8TW, 8WA, 8WY, 8WZ, 8XM, 8XX, 8ZE, 8ZD, 8ZG, 8ZN, 8ADE, 8AEY, 8AFB, 8AFD, 8AFM, 8AHS, 8AHY, 8AIB, 8AIO, 8AKV, 8AMJ, 8ANB, 8ANP, 8APP, 8ARK, 8ATM, 8AVB, 8AVO, 8AVT, 8AWV, 8AYH, 8AYN, 8BDO, 8BFX, 8BHE, 8BNA, 8DRV, 9AP, 9CH, 9DF, 9DJ, 9EJ, 9FJ, 9BP, 9FM, 9FJ, 9FS, 9GX, 9HM, 9IW, 9KM, 9LQ, 9MC, 9ME, 9PC, 9QH, 9UM, 9UU, 9WO, 9ZJ, 9ZL, 9ZN, 9AAY, 9ABH, 9ABL, 9AGG, 9AJW, 9AMS, 9AMT, 9ANC, 9ANQ, 9AQM, 9AWZ, 9AZX, 9DMH, 9DWM.

9ZL, Manitowoc, Wisc.

1ARY, 2BK, 2UC, 3AQR, 3CC, (3UC), 3ZY, 5FV, 8AFS, (8AGK), 8AGO, 8AHH, 8AHH, 8AIB, 8APT, (8AVT), (8AWP), 8AXC, 8AY, 8AYN, 8BEN, 8BO, 8CP, 8DE, 8EA, 8EF, 8EZ, 8HY, 8JQ, 8KH, 8LU, 8MM, 8NQ, 8NZ, (8OI), 8OQ, (8RU), (8TT), (8WA), 8WY, 8YV, (8ZA), 8ZD, (8ZN), 9AAP, 9AAW, 9ABR, 9ACB, (9ACL), 9ACY, 9AEG, 9AFF, (9AGI), 9AHU, 9AIP, 9AIY, 9AJW, (9ANI), 9AYA, 9AYW, 9BF, 9BM, 9DNW, 9DON, 9DTR, 9DWM, 9DXM, 9DZB, (9FS), 9GO, 9GX, (9HM), 9KO, 9MC, 9ME, 9MS, 9PC, (9PN), 9UU, 9WO, 9WZ, 9XM, (9YAC), (9ZC), 9ZJ, (9ZN), 9ZH, 9ZS.

9AAP, Milwaukee, Wisc.

1XM, 2FP, 2AW, 2BGR, 5EA, 5FU, 8BA, 8BO, 8CF, 8CH, 8DE, 8EA, 8ED, 8EG, 8FK, 8GW, 8KF, 8LU, 8NZ, 8RY, 8SP, 8TT, 8UW, 8WA, 8WY, 8XK, 8XO, 8VE, 8ZA, 8ZD, 8ZR, 8ABZ, 8ACN, 8AFD, (8AFB), 8AGK, 9AKB, 8ANK, 8AVO, 8AYN, 8AYS, 8AZG, 9AP, 9BM, (9BP), 9FQ, 9FS, 9HM, 9KF, (9KO), 9ME, 9MC, 9OO, 9PC, 9QC, 9UU, 9VX, 9VZ, 9WO, 9WQ, 9WW, 9WZ, 9XG, (9ZC), 9ZJ, 9ZL, 9ZN, 9AAW, 9ABS, 9AGG, 9AEG, 9AIF, (9AIP), 9AQA, 9ARO, 9ARZ, 9ATO, (9AYW), (9AZA) 9DAX, 9DNW, 9DTN, 9DWP, 9DXM, 9YAC.

9DNC, Lincoln, Nebr.

5AR, 5ER, 5EK, 5HV, 5IZ, 5JR, 5NS, 7MO, 8IV, 8BE, 8DEP, 9AAW, 9AYK, (9APN), (9DJZ), (9ANF), 9AYW, 9ARQ, 9YA, 9ZU, 9AYN, 9AFB, 9WW, 9AEG, 9VK, 9DK, 9OO, 9AWK, 9AFK, 9BP, 9XI, 9AYH, 9MC, 9AKE, 9OP, 9DUP, 9DPG, 9ACB, 9DEH, 9ZL, 9AFF, 9WI, 9ANR, 9DWW, 9DUO, 9XK, 9UU, 9AJW, 9ATN, 9AOJ, 9YO, 9DFL, 9HM, 9AKC, 9EL, 9ASN, 9YAC, 9ZN, 9DUG, 9AIS, 9DYM, 9ANQ, 9IY, 9AWQ, 9AQM, 9LX, 9ANN, 9DEP, 9UF, 9ZJ, (9AEQ), 9QC, 9AJT, 9ACL.

9CR, Chicago, C.W. Stations Copied on 1QP Circuit.

2DN, 2EL, 2FP, 2FS, 2GR, 2KL, 2RR, 2WD, 2ADL, 2AJF, 2AJW (dnlite), 2AWL (dalite), 2BFZ, 2XX, 2ZL, 2ZV, 3BZ, 3HB, 3ZO, 3ZY, 3ZZ, 4GL, 8BI, 8BO, 8BT, 8DE, 8DR, 8FB, 8HA, 8HJ, 8IL, 8IV, 8JM, 8JQ, 8LX, 8OH, 8OI, 8OW, 8QY, 8RQ, 8WR, 8WY, 8ACF, 8ADY, 8AFB, 8AIO, 8ANK, 8AQZ, 8BCL, 8XH, 8XM, 8ZN, 8ZZ, 9ALB, 9AZX, 9XM, 9ZB, Canadian 9AL.

9ME, Ft. Wayne, Ind.

Spark: 1ARY, 1BDC, 1HO, (2ARY), 2AWU, 2BFZ, (2EL), (2BG), (2BK), (2FP), 2FR, 2GR, 2RM, 2TS, (2WB), 3AL, (3CC), 3IW, 3VV, 3ASK, (4BQ), 4EL, 4EY, (4GN), 4IE, 4XK, 5DA, 5ZL, 5FV, 8ACF, (8ACS), (8ADO), 8ADZ, (8AFB), (8AFD), 8AFS, (8AGK), (8AHH), (8AIB), 8AIG, 8AIN, 8AIO, 8AJT, 8AKV, 8APB, (8AQV), 8ARS, 8ARV, 8AVO, 8AWB, 8AWP, 8AWU, (8AXC), (8AYN), 8AYS, (8BA), 8BBU, 8BDY, (8BEP), 8BH, (8BO), 8BK, 8BF, (8CH), (8CP), (8DZ, 8EA, 8EV, 8EZ, 8FZ, (8FT), (8FU), 8GO, 8ID, 8HU, (8JL), 8KH, 8LH, (8LW), 8MZ, 8NL, 8NZ, (8MM), 8MR, (8OI), (8OJ), (8PD), 8RJ, 8RM, 8SP, (8TK), (8TT), 8UC, 8UP, 8VK, (8WA), (8WU), 8WR, (8WY), (8ZA), (8ZD), 8ZN, (9AAW), (9AAV), 9ABH, 9ACB, 9ACU, (9ACY), (9AFK), (9AGR), 9AHI, 9AIP, (9AIR), 9AIU, 9AMK, 9AMS, (9AMT), 9AQC, 9ARM, (9ARY), (9AWU), 9AYA, 9AZA, 9BF, 9DON, 9DSO, (9DWM), 9DYC, 9DYT, (9FG), 9FQ, (9FS), 9GC, (9GX), 9HM, (9HR), 9KO, 9KA, (9MC), (9UH), (9UU), (9UW), (9VL), 9VK, 9VP, (9WO), 9WZ, (9VZ), 9YQ, 9ZB, (9ZJ), (9ZL), (9ZN), 9ZY, C.W.: 1RU, 1CAK, 2AJF, 2AWL, 2BFZ, 2DN, 2GR, 2ZL, 3HB, 3ZO, 3ZY, 4GL, 4ZL, 8ADS, 8AIC, 8AIG, 8AIO, 8AIR, 8ANK, 8ASF, (8CF), 8CI, (8DE), 8DR, 8GW, 8HJ, 8JJ, 8LF, (8II), 8OW, 8QY, 8WY, 8XAC, 8XM, 8ZB, 8ZN, 8ZU, 9ACB, 9ALB, 9ALH, 9HJ, (9ASX), 9LQ, 9XAC, 9ZAC, 9ZB, 9ZAX.

9CP, Hammond, Indiana

(2AWL), (2ARY), 2EL, 2FP, 2UK, (3AHK), 3CC, 3HJ, (3IW), 3XF, 4AL, 4EL, 5HV, 5HZ, 8ACD, (8ACF), (8AFD), (8AFS), 8AGK, 8AIB, (8AIO), 8ANO, (8AQV), (8AVT), (8AWP), 8AXC, (8AYN), 8BBU, 8BCG, (8BDY), 8BT, 8BO, (8CP), (8EA), 8EV, (8EZ), 8ID, 8IJ, 8JL, 8KH, 8LU, 8ME, 8QRA, PSE?, 8NL, 8OI, 8SP, 8TK, 8TT, (8TY), 8UC, (8WA), 8YV, (8ZAA), 8ZE, (9AEF), 9AEG, 9AMK, 9AQM, (9ASN), 9AZX, 9DWM, (9DAX), 9DXM, 9DPH, 9FQ, (9FS), 9HM, (9KO), 9MC, (9ME), 9MS, 9PC, (9PN), (9VZ), (9UH).

9DTJ, Francesville, Ind.

3CC, 3IW, 4BQ, 4IE, 4XK, 5EK, 5FV, 8AFB, 8AFD, 8AIC, 8AP, 8ARS, 8AWW, 8AXC, 8AYN, 8BBW, 8KH, 8MM, 8RP, 8TT, 8WA, 8WP, 8WW, 8WY, 8ZN, 9AAW, 9AAY, 9ACA, 9ACD, 9ACR, 9ACY, 9AEM, 9AFI, (9AGR), (9AIU), 9AII, 9AKC, 9ALS, 9AMS, 9ARM, 9AYN, 9AYW, 9AZA, 9AZF, 9CD, 9CF, 9HM, 9KO, 9LQ, 9MC, 9MS, (9NY), 9OS, 9QH, 9RP, 9UH, (9VL), 9WW, 9WY, 9XB, 9YH, 9YI, 9ZJ, 9ZL, 9ZN, Canadian 8BP.

9DQA, Peoria, Ill.

2AJF, 2AWL, 2GR, 3BZ, 4GL, 5DA, 5DW, 5EK, 5ER, 5FV, 5HL, 5JR, 5XJ, 5ZX, 8AFB, 8AIO, 8AMP, 8AYN, 8AYW, 8BCL, 8CF, 8DE, 8DR, 8GO, 8HA, 8HU, 8II, 8IV, 8JM, 8LF, 8LX, 8NQ, 8OW, 8TT, 8WA, 8WY, 8XB, 8XM, 8XV, 8ZB, 8ZY, 9AAP, 9AAW, 9AAY, 9AEF, 9AEG, 9AEQ, 9AFK, 9AG, C.W., 9AGG, 9AJW, 9AK, 9AC, 9ALB, 9ALI,

9AMK, 9AMS, 9ANF, 9ANQ, 9ANR, 9AP, 9APG, 9AQM, 9ARZ, 9AWX, 9AXU, 9AYW, 9AZA, 9AZX, 9AZF, 9BM, 9DAY, 9DAZ, 9DBU, 9DEU, 9DEW, 9DUG, 9DWM, 9DYA, 9DYY, 9EL, 9FQ, 9FS, 9FW, 9HM, 9HR, 9LY, 9WO, 9LQ, 9MC, 9MS, 9MQM, 9MQZ, 9NQ, 9OI, 9OO, 9RH, 9TR, 9UU, 9VK, 9VZ, 9WI, 9WZ, 9XAC, 9XAF, 9XM, 9YAC, 9ZB, 9ZC, 9ZJ, 9ZL, 9ZN, 9ZS, 9ZY.

August Station Reports

1MD, Dorchester, Mass.

Steadiest	Loudest
1BPZ—1TS—1CAK	1ARY—1AW—1TS
2ARY—2AWP—2JU	2OM—2ARY—2JU
3BZ—3CC—3OU	3CC—3BZ—3HJ
4EY—4GL	4GL—4EL
8DE—8AFB—8AWP	8SP—8AYN—8ZD
9ME—9UH—9ZJ	9ZJ—9UH—9ME

1FB, Scarborough, Me.

Steadiest	Loudest
1BDT—1BPZ—1CZ	1BDT—1CK—1ZE
2ARY—2AWL—2BG	2ARY—2EL—2AWL
3OU—3HJ—3IW	3OU—3HJ—3VW
4GL—4EA—4EY	4GL—4EA—4EY
8AWP—8WY—8DE	8AFD—8WY—8DE
9UH—9ZL—9ZN	9ZN—9ZJ—9AAW
8BP (Canadian)	8BP—9AL—2AX

2AQF, New York

Steadiest	Loudest
1BDC—3VW	1GM—1BDC—1HO
4GL—4EY—4EA	3GX—3CC—3IW
8SP	4EY—4EA—4GL
8BT—8DE—8AIO C.W.	8SP—8AWP—8AFB
9UH—9ME—9AIR	8BT—8DE—8AIO
	9UH—9AIR—9VZ

3CC, Abbingdon, Pa.

Steadiest	Loudest
1HO—1OE—1ZE	1BDC—1OE—1HO
2EL—2BG—2JU	2EL—2AHU—2JU
3XF—3GX—3ZO	3HX—3ZO—3OU
4GL—4EA	4EA—4GL
8AWP—8AXC—8AGK	8AWP—8AGK—8AFB
9AAW—9UU—9ZN	9ZJ—9ZN—9AAW

5ZL, Little Rock, Ark.

Steadiest	Loudest
2FP	2FP
3BP—3FS	3BP—3FS
4BQ—4GL—4DM	4BQ—4FD—4GL
5FV—5HZ—5NS	5EK—5FV—5ZAM
8DE—8EZ—8PS	8DE—8CF—8VY
9HM—9AEG—9PS	9HM—9AAW—9AEG

9ZL, Manitowoc, Wisc.

Steadiest	Loudest
2BK	2BK
3CC	3CC
5FV	5FV
8TT	8AGK
9YAC	9YAC

9ZL, MANITOWOC, WIS.

(Concluded from page 44)

Panama, Honduras, Guatemala, Mexico, and in the Atlantic, Pacific and Gulf. They have been reported QRK by eight west-coast amateurs and were read steady for a half hour one night in August by 6JD. The naval station at Manitowoc, NTY, where Burhop pounds brass in uniform, was closed on Aug. 23d and Burhop transferred to Washington to operate NAA, NSS and NDD circuits. The same set and fists probably will be heard again shortly, this time signing a "3" call.

OPERATING DEPARTMENT

(Concluded from page 42)

ciate it. Too bad that a man of this type is handicapped by lack of power. (We need you, Groves—we know you can do it, so frame up on Old Man "Hard Luck".)

In connection with O.M. Groves, any of you who are having difficulty in receiving the C.W.'s, if you will write him, the Manager is sure he will be more than glad to set you straight.

Nothing of interest from the Norfolk District this month, as City Manager White is off on his vacation. 3VV is being heard quite often working with his spark, and C.W. also, but just what each station has done during the past month is not known. The next report will contain full details of the Norfolk activities; that is, if White doesn't sink to the bottom of Mountain Lake and stay there.

On the whole, the situation in the Division looks splendid. The stations are all in fine shape, and most of them right up to the minute.

In conclusion, if the Manager can assist any of those who are now struggling to get their plants going and who are having trouble, he will be glad to be of service to those who will write.

Insulated Wire for Receiving Aerials

"IT is essential, especially in large towns, to use an insulated or enameled wire (for aerials) in order to prevent corrosion taking place. It will be found that an ordinary bare copper or phosphor-bronze wire will very shortly become covered with a deposit when exposed to the open air. It has been ascertained by the following experiment that a bare wire will lose about 20 per cent. of its efficiency as an aerial after about three or four weeks exposure.

"Two aerials of similar dimensions, one being of enameled and the other of new bare copper wire, were erected on a certain date. The signal strength from a known station was compared on each aerial daily, with the result that the signals due to the bare wired aerial gradually dropped off until there was a reduction of about 20 per cent., after which no further diminution was noticed. On examination this wire was found to have become corroded and covered with a deposit of oxide. The reason for the reduction in signal strength is doubtless due to the high resistance offered to the surface currents by this corrosion."

—Capt. H. de A. Donisthorpe, in "The Wireless World", Aug. 6, 1921.



THE A.R.R.L. has the pleasure of announcing the completion of affiliation of the following additional societies as of Sept. 2, 1921:

Boston Executive Radio Council,
Boston, Mass.
Iowa Radio Relay League,
Cedar Rapids, Iowa.
Radio Club of Brooklyn, Brooklyn, N. Y.
Chicopee Radio Assn.,
Chicopee Falls, Mass.
Brooklyn Tech Radio Club, Brooklyn, N. Y.
Scarsdale Wireless Assn., Scarsdale, N. Y.
Granite City Radio Club,
Granite City, Ill.
Seymour Radio Club, Seymour, Ind.
Northampton Radio Club,
Northampton, Mass.
Twin City Radio Club,
Lewiston, Maine.
Amateur Radio Club of Vancouver,
Vancouver, B. C.
Montclair High School Radio Club,
Montclair, N. J.
Middlesex Wireless Assn.,
West Somerville, Mass.
Greater Boston Spark Coil Club,
Dorchester, Mass.
Amateur Radio Assn. of Delaware County,
Media, Pa.
The South Bend Radio Research Club,
South Bend, Ind.
Haddonfield Radio League,
Haddonfield, N. J.
Rutherford Radio Club, Rutherford, N. J.
West Haven Radio Assn.,
West Haven, Conn.
QRV Radio Assn., Uniontown, Pa.
Warren Radio Assn., Warren, Pa.
Rocky Mountain Radio Assn.,
Denver, Colo.
Atlanta Radio Club, Atlanta, Ga.

QST Affiliated Clubs!

We have an announcement that will be of interest to all affiliated clubs. There is much that someone at A.R.R.L. Headquarters, with opportunity to study club work all over the country, could do to improve the average club; the time has come when there is need for some central clearing-house for information, for someone to advise clubs in their problems, to assist in the formation of new societies, and in general look after the welfare of the many hundred organizations now affil-

ated with the A.R.R.L. At the last meeting of our Board of Direction our Traffic Manager, F. H. Schnell, was instructed to undertake this new work, and he invites correspondence from all of our clubs. Mr. Schnell is an experienced man in club organization work, and is one of the originators of the so-called Chicago Plan which was instituted while he was City Manager of Chicago.

It will be his aim to assist clubs in making their meetings successful, to supply practical suggestions in the formation of new organizations, and in general to improve the efficiency of those activities of clubs which form the basis for our mutual affiliation. Let him hear from you, not only when he can help but when you have good ideas that might be of benefit to the entire craft.

Eighth District Convention

Plans are in definite form now for the big convention of the Eighth District, to be held at the Hotel Iroquois, Buffalo, Friday and Saturday Oct. 28 and 29, and a big attendance is assured.

The first day will be devoted to the organization of an Eighth District Executive Council, representatives from most of the clubs being present. The evening will be devoted to technical talks, invitations having been sent a number of well-known engineers. The second day is likewise to be spent in technical work, with a banquet in the evening. The radio inspector will hold license examinations on one or both days.

The Radio Assn. of Western New York is sponsoring the meeting, and general correspondence concerning same should be addressed to A. H. Benzee, General Chairman, 196 Keystone St., Buffalo, or via radio to 8FE. "There is a place for you—will you be in your place?"

Radio Engineering Society

The Radio Engineering Society held their third annual outing on August 6th at "The Pines", near Pittsburgh, with a big attendance. Prizes were given for all sorts of interesting contests: reception speed, a magnet race, insulator race, wire rolling contest, pie eating, for the best portable antenna, C.W. transmitter, C.W. receiver,

(Concluded on page 57)

Strays



FLASH!

MUU, Carnarvon, Wales, will transmit reception report from Godley each night during the Transatlantics, on 14,200 meters. Get your coils ready and see next QST for details.

If you want to see a good proof of the old saying that "imitation is the sincerest form of flattery", take a squint at the name of the author of the story on page 209 of "Radio News" for September.

Dr. Lee deForest, after many years as the head of the DeForest Radio Tel. & Tel. Co., resigned on Sept. 26 as its active head and will live in Germany the next few years where freedom from business cares and the opportunities for obtaining highly trained help will enable him to complete certain important research work. Mr. Chas. Gilbert, who has been treasurer of the DeForest company since 1915, has been elected its president and general manager, and will be assisted by Mr. R. M. Keator who will have charge of sales and manufacture.

To shield receivers from the capacity of the hands, which causes swinging of C.W. signals, try pasting tinfoil on the back of the panel. Cut out carefully around bushings, switch-points, etc., and leave a lug on it to be connected under the earth binding post to ground it.

Our old friend Robert K. Trump of Topeka, Kan., 9BT and pre-war 9JW, is ill. He is a dyed-in-the-wool bug and nothing hurt him like having to miss the Convention. This old-timer rates a letter from all who know him, to help pass the time away. Why not drop him a letter or a radiogram, fellows? His address is 202 Locust St., Ottawa, Kansas.

7XD and 7ZD both write us requesting that we announce an error in their listing in call-books which is causing much confusion. Everybody please note that 7XD is Glenn E. West, Billings Polytechnic Institute, Polytechnic P.O., Billings, Mont. 7ZD is R. E. Dawes, Box 663, Bozeman, Mont.

You know these big signs of United States Tires, along highways, giving a "History of the United States"? Signs near Ossining, N. Y., and Keyport, N. J., recount the amateur radiophone accomplishments of 2XX and 2QR, respectively, in a way that is attractive advertising for Citizen Wireless.

In one of the recent issues of QST the Diamond State Fibre Co. in an advertisement stated that the phase difference of Condensite Celeron at 3067 meters wave length was found by a test conducted by the Bureau of Standards to be 1.2. This figure should have been given as 1.8. The advertiser has written us asking us to make this correction.

The Amrad double prize contest, with \$175 worth of apparatus offered for the best names for their new receiving equipment, has been extended beyond the original closing date announced at the Chicago Convention, to Dec. 31, 1921. Full particulars may be obtained from the American Radio & Research Corp., Medford Hillside, Mass.

Harvey Mitchell Anthony, of Muncie, one of our directors, on August 1 was appointed by Governor McCray of Indiana to serve for two years as a member of the Indiana State Board for the Registration and Examination of Professional Engineers and Land Surveyors.

Arnie Clucas, 8ATF, Toledo, Ohio, departed this life on July 31 following an unsuccessful operation for injuries sustained a few days previous while swimming. Clucas was a member of the A.R.R.L. and well known in the vicinity of Toledo, and his loss will be keenly felt.

Hall Berringer, formerly of Burlingame, Calif., where his station, 6ZR, was one of the finest on the west coast, has moved to Los Angeles where he is re-erecting and expects to have a bang-up League relay station for this winter. His new address is Room 206, 752 So. Los Angeles St.

1NAP is enough to make the spark gap.

Radio Communications by the Amateurs

The Publishers of QST assume no responsibility for statements made herein by correspondents.



WHICH WOULD YOU RATHER?

Department of Publicity of the
Presbyterian Church in the U.S.A.,
156 Fifth Avenue,
New York City.

Editor, QST—

In an editorial on page 31 of your August issue, headed "Salem: A Comedy," you say that Salem "used to burn witches without first giving them a chance to be heard."

Salem never burned any witches nor any other people. Courts of Massachusetts sitting at Salem did condemn so-called witches to be hanged, and some of them were hanged after public trial at which every accused person had full opportunity to present his or her defence. But not one was burned.

Perhaps, since you are so much mistaken about this matter you may be in error concerning the other Salem matter which you discuss in the same editorial.

Yours sincerely,

Walter I. Clarke,
Director.

TWO SIDES OF THE SAME STORY

Naval Radio, NRH,
Cleveland, Ohio.

Traffic Manager, A.R.R.L.—

The Cleveland Radio Club has been giving some very fine concerts each week, and the modulation is very good. About every time they start in there are some of the fellows do not seem to enjoy good music or want anyone else to hear it—there is altogether too much unnecessary QRM. Why can't some of these fellows use a little consideration for others. QRT holding the key down and speeding that old noise wagon up! There is a concert given every Friday night by the C.R.C. Any real DX man will clear up his traffic quickly and in a business-like manner—why can't others do the same?

Yours for the best in radio,

W. E. Hiler, Elec. U.S.N.

Bristol, Conn.

Editor, QST:

It isn't my usual custom to kick about QRM conditions, realizing that there are thousands of amateurs on every night, each with equal right to use the air. But there is one form of QRM which has been

increasing constantly and which bids fair to ruin relay work. The form of QRM which I have in mind is these daw-gone radio "concerts", so-called. Why don't they come under the caption of "unnecessary interference" which the radio laws forbid? It puts the "How-do-I-come-in" stuff off the map completely. The radiophone is a fine thing in its place but why clutter up the already over-jammed 200 meters with this "We-will-now-favor-you" bunk. If those birds can't satisfy themselves with inflicting phonographic punishment on their next-door neighbors and must spread the affliction over a greater area, why not apply to the Radio Inspector for a license to use a wavelength other than 200?

I would like to have the opinions of others on this subject.

Respectfully yours,

D. H. Mix, 1TS.

PUZZLE: FIND THE EPITHET

Hartford, Conn.,
June 23, 1921.

Hon. Miles Poindexter,
U. S. Senate,
Washington, D. C.

Dear Mr. Poindexter:—

In the hope that you may find it interesting I am herewith inclosing you a copy of the May issue of our monthly Magazine, QST, on page 27 of which occurs an editorial relating to your latest radio bill.

I also attach excerpted editorials from our issues for June and July relating to the two bills introduced in the house by Congressman White and in the Senate by Senator Kellogg. Our views thereon as regards the desirability of writing the future of the amateur into any new legislation apply to your own bill as well.

We bespeak your kind consideration of our views.

Sincerely yours,

K. B. Warner,
Secretary-Editor.

United States Senate,
Committee on Mines and Mining,
July 23, 1921.

Mr. K. B. Warner, Sec'y-Editor,
American Radio Relay League,
Hartford, Conn.

Dear Mr. Warner:

I have yours, enclosing several articles relative to pending legislation affecting

radio, and am very glad indeed to know your views. We have learned, long ago in the various controversies of life, that epithets such as you use, are not arguments and do not carry much weight. The bill which I introduced will not be acted on or considered for some time, probably not until the fall. Nobody that I know of desires to do any injury to the amateur radio operators; at the same time, it is the purpose of the legislation, and will continue to be, to regulate radio operation in the proper way, including amateurs as well as professionals, without in any way doing an injury to their activities.

With sincere regards,

Very truly yours,
Miles Poindexter.

DE GODLEY, RE TRANSATLANTICS

Cedar Grove, N. J.,
Oct. 4, 1921.

Editor, QST:

The news that the Board of Direction of the American Radio Relay League had chosen to send me to England in connection with the Transatlantic Tests found me unable to express my appreciation of the great honor thus bestowed. The realization that success, or failure, to establish communication with our British cousins might depend on such judgment and skill as I possess deeply impressed me with the great responsibility which the mission involves. Neither have I over-looked the wonderful possibilities in the way of international communication among amateurs which success would insure, and I wish to say to all that *I shall do my very best*.

A great many have been asking me what equipment I propose to use. I have had to say to them in each case that I was telling no one for the very good reason that I did not know. Naturally, I have made plans for securing equipment but these plans are not final and the list will be subject to change up to the last minute because, altho I now feel quite sure of the equipment which I have chosen, I cannot be certain that there is no better equipment available. In any case I shall have to use my own best judgment. Such choice as is made will have been made in a thoroughly unbiased manner. If *anyone* feels that equipment of which he knows is of such nature as to be exceptionally well fitted for use in these tests I would consider it as a great favor should he tell me about it.

Do I expect to hear signals? Yes!—lots of them, and I will not be at all surprised if Pacific Coast or Mississippi Valley signals come over to me with the same consistency as Atlantic Coast signals. It looks to me very much like a free-for-all with no favorites. I hope that all the

men will take a look at the globe. I believe that they will be impressed by what they see there.

I am,

Yours respectfully,
Paul F. Godley.

AMATEUR CORRESPONDENCE INVITED

The First Surinam Radio Association,
Paramaribo, Surinam,
Dutch Guiana, South America,
P. O. Box 145.

Editor, QST—

I am directed by the members of my association to communicate with you with the object of establishing a friendly connection with your association as well as with its members individually.

Ours is quite a young body, and we think that a connection with you as referred to would benefit us to a great extent.

We are a lawfully established society, whose members are all enthusiastic radio amateurs or students. The object of our association is to increase and improve its members' knowledge and experience of the Craft by placing at their disposal the best reading and study in periodicals and books, but principally by affording them a chance through our foreign connections to keep in touch with radio amateurs and professionals of tried and varying experiences.

We therefore seek your aid to attain in some degree the object we have in view by putting this letter and its contents before the members of your highly esteemed body and if possible urging them to communicate with us. We emphatically declare that any letter addressed to our office will be sure to receive a speedy reply.

We are very often in touch with American operators on board American vessels calling at this port, and our executives are commanded to entertain henceforth every "wireless man" visiting this city who should happen to give us a look-up. Every operator on the "Clyde Line" steamers which regularly call at this port is in a position to give information concerning us.

Concluding we must request you to consider this our initial communication of a series of more important ones which we will be forwarding in a short time, and you are authorized to inform every "radio bug" desirous of communication with us that his reply is positively guaranteed.

Thanking you in anticipation of satisfactory results, we are,

Yours for future connection,
First Surinam Radio Association,
Per D. A. Nunes, Secretary.

Attention is directed to change in dates of preliminaries for Transatlantics to Nov. 1 to 6, 1921. See page 29.



Bound
Vol. IV
of
Q S T

\$4
Post-
Paid

Another milestone in Amateur Radio is passed by the completion with the July issue of Volume Four of QST.

This is now available in bound form and deserves an important place in every amateur's library.

Volume IV contains the reports on the Fading Tests, the prize winning essays on the Ideal Spark Transmitter, and numerous articles on the design and construction of tube transmitters. As marking the expanding adoption of C.W. transmission, Volume IV is historically of interest. QST at its best—worthwhile and valuable matter leavened with the lighter side of radio.

This is the ideal way of preserving QST for ready reference. Handsomely bound in dark red cloth, heavy board covers, gold lettering. Ready for immediate shipment, \$4 postage paid.

QST, Hartford, Conn.

WITH THE AFFILIATED CLUBS

(Concluded from page 53)

wave meter, and best exhibit of workable old relics of pre-license days, etc.

Then there was a baseball game between the Sparks and the C.W.'s, and a big chicken dinner, after which there were talks by Messrs. Kinter, McCullough, Traffic Manager F. H. Schnell, Conrad, Thomas, Wiggin, Rosenberg, Hewitt, Coleman, Dr. Cruikshank, and Urban. "A large time was enjoyed by all."

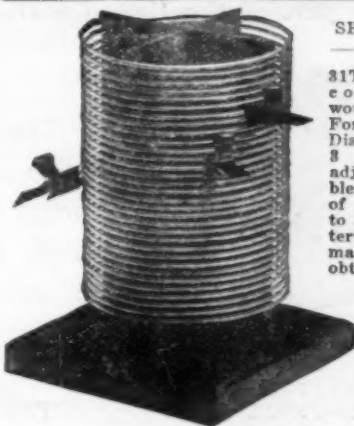
New Club Organs

"QTC", founded originally in Rochester, N. Y., is now being published for the Eighth District by the Radio Assn. of Western New York, J. Alexander being the editor. The first issue under the new management is live and peppy.

Another interesting club paper is "B.C.R.C.", the organ of the Bay Counties Radio Club of Oakland, Calif., which has been greatly improved and now comes forth as a 28 page mimeographed magazine 8½ x 11 inches in size.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

Radio Service APPARATUS OF MERIT



SPECIFICATIONS

31T, No. 10 hard copper wire, wound on a slotted Formica form 4½" Dia. Supplied with 8 clips making adjustment variable to a fraction of a turn. Tunes to 350 meters. Materials and workmanship the finest obtainable.

C.W. INDUCTANCE—TYPE S50...\$8.50

ALSO FOR YOUR C.W. SET

.0005 M.F. Mica Condenser, Type S22M...\$1.00
Single Socket, Type S10..... 1.00
Double Socket, Type S3..... 2.25
Triple Socket, Type S4..... 3.25
4 amp. Cage Rheostat, S14A..... 2.00
NOTE: All the above apparatus equal to Navy standards.

Radio Service Apparatus may be obtained at all Reliable Dealers or sent postpaid on receipt of price.

RADIO SERVICE & MFG. CO.
Worlds Tower Bldg., 110 W. 40 St., N. Y.
Factory, Lynbrook, L. I.

Wireless Amateurs Attention!

If you want service, order from us. We carry a large stock of High Grade Wireless Apparatus of our own and other manufacturers.

SPECIAL!

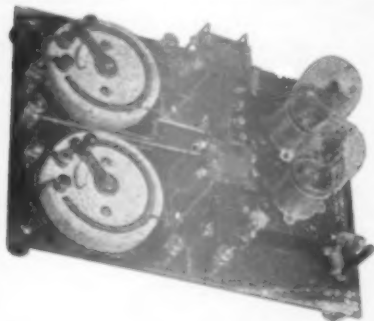
Vacuum Tube Sockets.....\$1.25
Rheostats 1.25
22½ Volt "B" Batteries..... 1.50
Rasco Dials60
Rubber Binding Posts..... .20
Tested Galena..... .40
Lateral Wound Coils. All Sizes.

Send 5c for our large illustrated catalog.

J. M. PAQUIN,
THE ELECTRICAL SHOP,
787 Queen St. West, Toronto, Ont.

REDUCED PRICES!!

We have a limited number of the units shown below which will be disposed of at bargain prices. All orders should be accompanied by money order or check, and will be filled in the order of receipt. Prices include free postage to any part of the United States.



**TRIODE TWO-STEP AMPLIFIER
TYPE E—PRICE \$22.37**



**TRIODE EATON OSCILLATOR
TYPE C—PRICE \$6.90**



**TRIODE AUDIO TRANSFORMER
TYPE P—PRICE \$3.50**



**TRIODE VACUUM TUBE
SOCKET, TYPE F—PRICE \$0.90**



**TRIODE GRID LEAK
TYPE G—PRICE \$0.50**

This amplifier is equal in efficiency to any other amplifier on the market, regardless of price. For this sale only, it will be sold complete without tubes, at the hitherto unheard of price of \$22.37.

The Eaton Oscillator will transform straight receiving circuits to oscillating circuits without any adjustments of any kind. This is the simplest and cheapest way to hear all arc, tube and high frequency alternating signals, and can be had for only \$6.90.

This transformer provides a maximum of low frequency amplification, and can be used with the new Radio Corporation tubes. While they last, they can be had for \$3.50 each.

This socket will take all standard receiving and amplifying tubes. It has a real machined bakelite dilecto base that will not crack, also rubber feet, and countersunk screw holes for mounting. Now only \$0.90 each.

A constant unchanging resistance of 500,000 ohms, securely mounted and enclosed between two pieces of bakelite, and impregnated under vacuum with insulating material. Now only \$0.50 each.

**WIRELESS SPECIALTY APPARATUS COMPANY
BOSTON, MASS. U. S. A.**

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Faradon

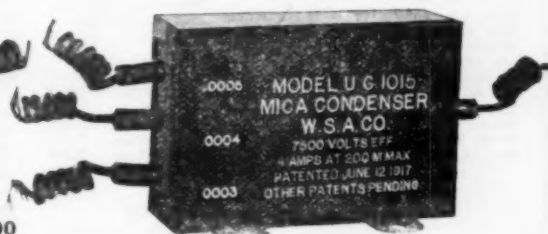
FOR SERVICE

Until recently practically all tube CW transmitters have utilized circuits in which the transmitted wave length largely depended on the antenna constants, with many resulting disadvantages. New circuits recently developed for low power tube transmitters make the wave length independent of the antenna. These circuits require the use of several types of condensers which have never been previously built for amateur work, but which have now been made available.



MODEL UC 1014 **PRICE \$2.00**

KEY CONDENSER—Developed primarily for use as a grid leak condenser, radio frequency by-pass condenser, or key condenser in circuits utilizing Models UV-202 or UV-203 radiotrons. Condenser has mounting tabs on back. Its rating is .002 mfd., 3000 volts eff., 2 amp. at 200 meters maximum.



MODEL UC 1015 **PRICE \$5.40**

SERIES ANTENNA CONDENSER—Also especially applicable as an intermediate circuit condenser in circuits utilizing Models UV-202 or UV-203 tubes.



MODEL UC 1803 **PRICE \$5.00**

ANTENNA COUPLING CONDENSER—A very important unit due to extremely high power with extremely low capacity designed for the necessary low loss and high overload possibility without damage.



MODEL UC 1806 **PRICE \$7.00**

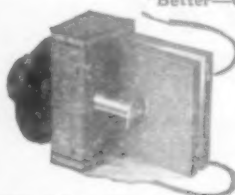
PLATE RADIO BY-PASS CONDENSER—Two of which are required across plate transformer with common connection grounded. Designed for high voltage surges which follow key transmission. Also suitable as grid condenser in higher power sets.

WIRELESS SPECIALTY APPARATUS COMPANY
BOSTON, MASS. U. S. A.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

Announcing THE CROSLY VARIABLE CONDENSER

Pat. Pend.
"Better—Cost Less"



This Condenser works on an entirely new principle. The two plates are hinged and are opened and closed like a book by means of a specially designed cam. The plates are surfaced with copper. One copper sheet is covered with mica so that when the

two plates are clamped tightly together the maximum capacity is obtained. The maximum capacity of this Condenser will average about .0008. We rate it conservatively, however, at .0005.

This Condenser has several advantages over the ordinary type of air condenser. Will stand 1000 volts without breaking down. It can therefore be used for CW work. Has no body or hand capacity effect. Has much greater signal strength due to the fact that mica is a much more efficient dielectric than air. The calibration curve of this Condenser is almost a straight line. Has unusually low zero capacity—.00006.

Price without knob and dial.....\$1.25
With knob and dial.....1.75

Mounted in cabinet with knob and dial.....2.50
Sold on a GUARANTEE of absolute satisfaction or money refunded.

CROSLY CRYSTAL RECEIVER



No batteries, tubes, etc., required.

Hook it to your aerial and phones

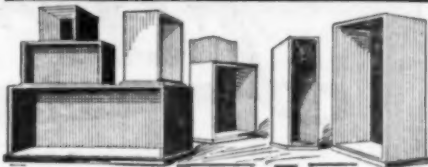
It will tune from two hundred to six hundred meters, bringing in spark, voice and music, with an average amateur aerial.

Complete with battery and inter-rupter for crystal testing, crystal, etc. Price \$7.00. Phones extra.

DEALERS: This will help you get 'em started

CROSLY MANUFACTURING COMPANY

Crosley Cabinets



The tendency in the radio field today is to put apparatus in cabinets not only for appearance's sake, but as a protection from dust, dirt, atmospheric conditions, etc. Realizing the demand for attractive stock cabinets of various sizes, we are building them in quantities in our large wood working plant. These cabinets are all uniform in style. The panels are rabbited in to the front. As the outside dimensions and inside dimensions are either larger or smaller than the panel itself, we show panel size and also inside dimensions. Prices quoted do not include the panels.

All cabinets are waxed antique mahogany finish. Wood used is either gum, genuine solid mahogany or quartered oak. Lids or tops are hinged. Sizes and prices are shown below:

For Panel Size	CABINETS Inside Dimensions			Mahogany or Quartered	
	High	Wide	Deep	Gum	Oak
6x7	5 1/2"	6 1/2"	7"	\$2.50	\$3.85
6x10 1/2	5 1/2"	10"	7"	2.75	4.40
6x14	5 1/2"	13 1/2"	7"	3.30	5.55
6x21	5 1/2"	20 1/2"	7"	3.90	7.30
9x14	8 1/2"	13 1/2"	10"	3.70	6.80
12x14	11 1/2"	13 1/2"	10"	4.40	6.80
12x21	11 1/2"	20 1/2"	10"	5.25	10.60

Cash must accompany order. No C.O.D's. We pay transportation charges.

We can furnish genuine formica panels 1/8" thick, cut to the following dimensions: 6x7; 6x10 1/2; 7x9; 6x14; 7x12; 6x21; 7x18; 9x14; 12x14; 14x18; 18x21. Price of panels—2 1/2 c. per square inch. For odd sizes order the next largest size: we will trim. We pay postage.

Every article bearing the name "CROSLY" is GUARANTEED to give absolute satisfaction or money will be refunded.

We shall be pleased to send literature describing the above mentioned and other radio apparatus to any one free of charge upon request. Get your name on our mailing list to receive latest Bulletins of other new Crosley products. If your dealer does not handle our goods, order direct and send us his name.

Radio Dept. Q-4B.

Cincinnati, Ohio

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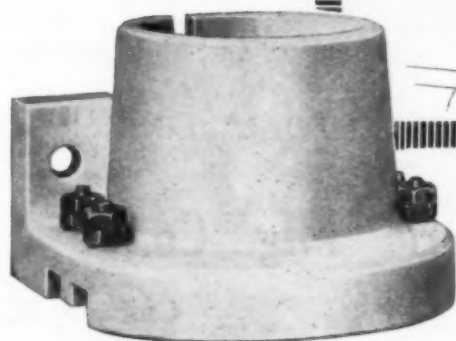
THE U. OF I. SUPPLY STORE, Inc.

627-29-31 WRIGHT ST.,

CHAMPAIGN, ILL.

CROSLEY

V-T SOCKET



PRICE

60¢

*Better—
Costs Less*

THERE must be good reasons for its instant popularity—why it was the hit of the Chicago Radio Show—why today it is the best seller.

It's the only socket made for both base and panel mounting. It's made in one piece, entirely of porcelain—there is no metal shell—hence no "ground hum." Its design eliminates possibility of short circuiting filament across high voltage "B" Battery. It is better—and costs only 60 cents. Be sure to use CROSLEY SOCKETS in the radio set you are building. Every live dealer handles them—if yours doesn't, send us his name and order direct—we will ship prepaid.

*DEALERS: It's worth your while
to investigate the CROSLEY line.*

CROSLEY MANUFACTURING COMPANY

RADIO DEPT. Q-4A,

CINCINNATI, OHIO

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

Q S T

We are now ready to furnish transformers for

Tube Transmission

Send in your specifications for filament heating and high voltage.

BACKED BY THE "GOLD MEDAL" LINE

Thordarson Electric Mfg. Co.

517 S. Jefferson St.,

Chicago, Ill.

"UNQUESTIONABLY THE BEST"

is the verdict of users of the "J-K" all-PORCELAIN audion socket.

Manufacturers

and Dealers

—"J-K"—

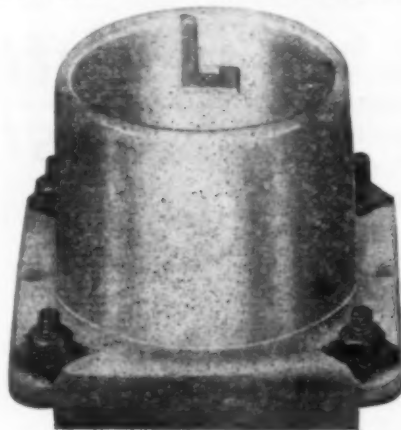
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your

investi-

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Radio

Clubs

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"Co-Op"

offer is

yours

for the

asking

The "J-K" organization saw the need of this improvement and now present the first all porcelain Vacuum Tube Socket.

Dimensions: Base $2\frac{1}{4}$ " sq., height, $1\frac{1}{4}$ ". Shipping weight 6 ounces.

Type ET-1, Vacuum Tube Socket, each..... 80c

Add postage to your zone on 1 pound.

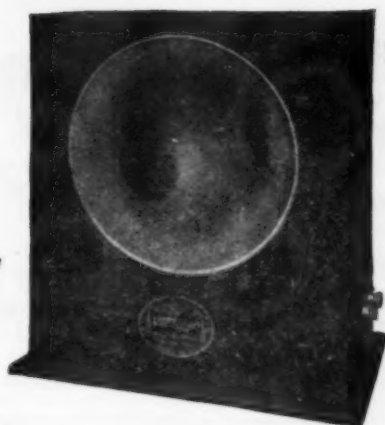
5c in stamps brings you the "J-K" Binder with Bulletins on new apparatus and places your name on list for future Bulletins. Get "J-K" apparatus at your regular dealer, if he cannot supply you, send order direct, with his name, to

JOY & KELSEY,

4021 W. Kinzie St., Chicago, Illinois

STATION TYPE
(In handsome mahogany cabinet as shown.)

\$30.00



Laboratory Type
(Mounted on metal base, adjustable height.)

\$25.00

THE

VOCALoud

THE IDEAL loud-speaker. Requires no batteries, no adjustments, no extra equipment whatever! Just hook VOCALoud right on to your receiving apparatus and

listen to your signals,—QSA all over your house! Uses genuine Baldwin reproducer,—equally good for telephone and telegraph. Your order shipped at once!

CORWIN'S improved SWITCH LEVER

Sure contacts, smooth operation, handsome appearance,—all are characteristics of this improved switch. Many switches give their manufacturers more profit,—none give their users more satisfaction. Try a Corwin Switch. As good as it looks!



PRICE:
90 cents
Postage,
5 cents.

Composition knob, identical with knobs, used on standard #67 Corwin Dial. Brass shaft is moulded right into knob,—it can never come loose. Blade, bushings, etc. nickel-plated brass. Contact radius, $1\frac{1}{4}$ ".

UNIVERSAL-COIL MOUNTING PLUGS

For Radisco and all hand wound coils. No bending, no filing, they fit exactly in the first place.

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Send your order today.

CORWIN'S
1921
CATALOG
10c

Send for your copy today!

NEW RADISCO VARIO-COUPLER

"Accurate to the .002 part of an inch. Moulded base, Formica tube, all metal parts brass.

\$7.50 postpaid

Remember Corwin's reputation for shipping mail orders promptly and in perfect condition.

A. H. CORWIN & CO.
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C-W Inductance--Type A 35



This CW Inductance has thirty-five turns of three sixteenth inch hard drawn copper tubing, affording a very low resistance conductor with an unusually large surface.

The turns on this inductance are six inches in diameter and wound on a grooved Bakelite frame, doing away with dielectric losses.

Complete with insulated connection clips.

Price - - \$12.00

Description of our complete line of Amplifying Horns, Radio Frequency Choke Coils, etc. in Bulletin No. 101, mailed free upon request.

COX MANUFACTURING COMPANY

3138 Payne Ave.,

Cleveland, Ohio



THE AMPLIFONE —THE IDEAL LOUD SPEAKER.—

Most loud speakers discriminate against the weak signal. Nearby stations pound in QSA but the faint ones don't come through. The Amplifone is designed to give the maximum efficiency on faint signals, and sensitiveness has not been sacrificed in order to secure great volume on very loud signals. For receiving the DX amateur stations and distant concerts the Amplifone is in a class by itself. The quality is sharp and clear and there is no distortion. And don't forget that the Amplifone gives sufficient volume so that signals of moderate strength can be heard all over the house.

PRICE \$20.00
Immediate Delivery

Bulletin 106 describes the Amplifone.

"BK me if QRM"

The Duplex Gap makes it possible to "Break" as on a land line. Just say "BK" and the transmitting station will hear you if it is equipped with a Duplex Gap.

PRICE \$6.00
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Bulletin 109 gives circuits and details. Send six cents in stamps for both Bulletins.

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Long Life
6.00 M-A
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For
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RECOMMENDATIONS:

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Dept. Q-1

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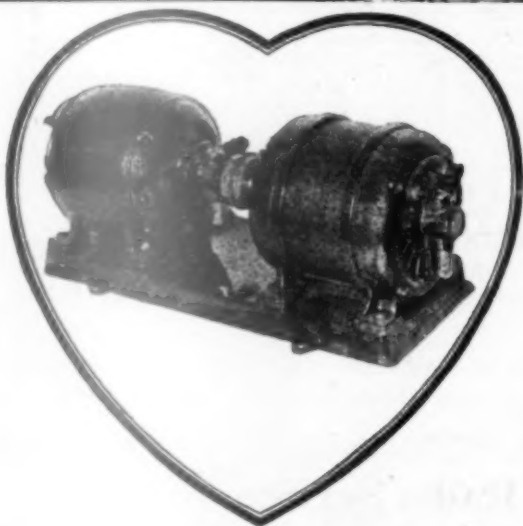
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 .001 mfd. in rubber case.....\$4.75
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Has YOUR radiophone
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A sturdy radiophone like a sturdy man must have a strong Heart. A Ray-Di-Co Motor Generator is a sure cure.

"Midget" "Hylo" "Standard"
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At our new salesroom we carry a complete line of
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These designs all developed by Commercial Radio Engineers under actual conditions and guaranteed at least equal to the best manufactured apparatus in all respects.

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Using An Inefficient Condenser Is Like Carrying Water In A Sieve



The same judgment used in the purchase of radio equipment that you use unconsciously in everyday affairs will invariably lead you to select COTOCO condensers. Users are unanimous in proclaiming them "the best."

This condenser used in conjunction with our inductance units will enable you to build a set that you will be proud to own.

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RADIO APPARATUS

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We have only listed a few items above, can furnish anything required for your set—we stock only high grade products.

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DeForest
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ROSE RADIO SUPPLY

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NEW ORLEANS, LA.

Send 10c for Catalog.

A WONDERFUL VALUE MURDOCK No. 56

RADIO RECEIVERS

(Patented—Other Patents Pending)

Exceptionally
well built.

Remarkable
Durability.

Maximum of
Sensitiveness

Uniformity
in Tone.

Encased in
Murdock-Moulded
Insulation.

The last word
in efficiency.

Unique in
design.



2000 Ohms

\$5.00

3000 Ohms

\$6.00

MURDOCK VARIABLE CONDENSERS

We are producing in large quantities, tried and true variable air condensers. Our manufacturing processes and large volume production make possible the sale of these instruments at prices lower than any other condenser of equal merit and in some instances, at prices considerably below those asked for inferior instruments. The dependability and general goodness of the MURDOCK Variable Condensers is a matter of universal knowledge. Inquiry of those who have bought and used them will confirm our claim that they are the best buy in the market.

PRICES:

No. 3660, panel type, 43 plates, .001 mfd, without knob, pointer or scale **\$4.00** each.

No. 3661, panel type, 43 plates, .001 mfd, (with knob, extension handle, pointer and scale) **\$4.25** each.

No. 3662, panel type, 43 plates, .001 mfd. (with special knob, extension handle and dial) **\$5.00** each.

No. 3680, panel type, 23 plates, .0005 mfd. (without knob, pointer or scale), **\$3.25** each.

No. 3681, panel type, 23 plates, .0005 mfd, with standing knob, scale and extension handle, **\$3.50** each.

No. 3682, panel type, 23 plates, .0005 mfd. with special knob, dial and extension handle, **\$4.25** each.

No. 366, Variable Condenser, 43 plates, .001 mfd. with case, **\$4.75** each.

No. 367, complete condenser, 43 plates, .001 mfd, **\$4.50** each.

No. 368, Variable Condenser, 23 plates, .0005 mfd. **\$4.00** each.

(Send for Bulletin No. 21)

Wm. J. Murdock Co.

65 CARTER ST., CHELSEA, 50, MASS.

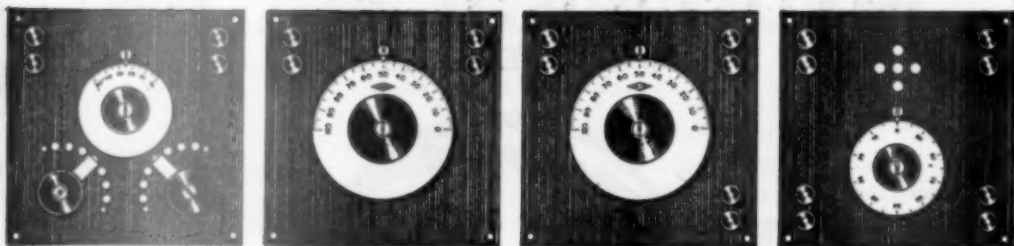
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8XS



8XS



For Your Receiving Set,

We recommend these four standardized unit panels. When coupled together they form a high grade, efficient short wave receiver complete with audion control for only **THIRTY-ONE DOLLARS**.

On the left is shown the variocoupler, with fine and coarse primary tuning switches and variable secondary coupling. Next is the grid variometer which controls the wave length from 175 to 450 meters, a range which may be increased if desired by a small fixed condenser. The third instrument is the plate variometer and last is the audion panel with grid condenser, leak, socket, rheostat, etc. The variocoupler and variometers are priced at **\$8.00** each and the audion control at **\$7.00**, all postpaid.

These are four instruments from the new series of unit panels which we manufacture. Each instrument is mounted on a panel of grained bakelite-dilecto 5" x 6" and the very best in materials, workmanship and design is used throughout. Other units, including condensers, amplifiers, etc., are described in our catalog which will be mailed for 5c.

THE WILCOX LABORATORIES, LANSING, MICHIGAN

QST de 8UX [QST'S Cartoonist]

The Art Critics tell me that as a Cartoonist, I would make a good radio salesman!

This is to announce the entering of my Radioart Store into the mail order field and I will oscillate with joy if you will send me your orders on the following popular pieces of apparatus. All shipments *postpaid* and *insured*.

Grebe CR-3 regenerative \$65.00
F&F skeleton regenerative set (two variometers and a variocoupler, variocoupler single turn tapped, 160-400 meters, very efficient) \$12.50
With Chelison dials \$15.50
Proudfoot cabinet 2 step \$25.00
Proudfoot cabinet detector \$10.00
Proudfoot cabinet det. and 2 step \$35.00
RHEOSTATS: Paragon \$1.50, FADA \$1.25,
DeForest \$1.65, Shramco \$2.00
SOCKETS: Remler \$1.50, DeForest \$1.25, Murdock and Sorala \$1.00, Porcelain \$0.80
AMPLIFYING TRANSFORMERS: Acme \$5.00,
Radio Corporation \$7.00, Sacoclad \$5.00.
RADIOTRON TUBES: Detector \$5.00, Amplifier \$6.50, Five watt \$8.00

PHONES: Baldwin C \$13.75, Brandes Superior \$8.00, Murdock Navy 3000 ohms \$6.00, 2000 ohms \$5.00

A BATTERY POTENTIOMETER: Radio Corp. \$2.00

"B" BATTERIES: BLOCK \$2.00, Unit three cell \$0.31

CRYSTAL DETECTOR: Jove \$2.00

GALENA: Per pkg. \$0.24

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INSULATORS: \$0.35, \$0.45, \$0.65

Agents for all kinds of CW apparatus: Grebe, Acme, Somerville, Gen. Radio, etc.

Whether or not you like my cartoons, you will like my prompt service.

RADIOART STORE, D. A. Hoffman, 8UX

50 S. Balch St.,

Akron, Ohio



THE VARIOMETER

The now famous Z. R. V. Variometer has met with a tremendous sale, thousands being in use, by those who know the quality of Clapp-Eastham products.

Complete with knob and dial.....\$6.50

Without knob and dial.....5.75

Varlocoupler to match with knob and dial 7.50

Complete catalogs sent for 6c stamps

Patronize your local dealer: If he won't supply our material your order will receive immediate Factory attention.

CLAPP-EASTHAM CO., 114 Main St., Cambridge, Mass.

Headquarters for Radiotron Tubes. All types in stock.



THE DIAL

This 3" knob and dial is our own product heavy brass dial black oxidized finish, composition knob 1 1/2" diameter. Supplied for 1/8" shaft only. This dial cannot chip or warp and will run true. Its beauty is in keeping with the best products of the instrument maker.

Price dial and knob \pm F800H complete..\$0.75



TYPE R3

MOUNTED \$4.50

THE LATEST A-A 10 to 1 RATIO AUDIO FREQUENCY AMPLIFYING TRANSFORMERS

With the introduction of the new UV-201 and C-301 Cunningham amplifying tubes we found it necessary to design an Audio Frequency Amplifying Transformer that would meet amplification and internal resistance constants which are quite different from those of the previous tubes. "A-A" amplifying transformers are scientifically designed for commercial manufacture and are made strictly on a quality basis. They are most efficient because the turn ratio and resistance of the windings are such that maximum amplification is obtained without distortion in the telephonic currents. The coils are wound with ± 40 enameled wire with treated paper insulation between the layers of winding and the convolutions of wire are spaced to cut the turn to turn capacity down to the minimum. This is a big factor in eliminating distortion—commonly known as howling. All of our transformers are impregnated in a special wax compound by the vacuum process.

UNMOUNTED \$3.50

SEMI-MTD. \$4.00

Our first transformer having a ratio of 3 to 1 has proved to be most efficient on Marconi VT's, Moorhead, Western Electric and similar tubes and will also be found desirable on the 3rd or 4th step using the UV201 tubes with our new transformer on the 1st and 2nd stage. It is known as AA Type R2.

MOUNTED \$4.25 UNMOUNTED \$3.35 SEMI-MTD. \$3.80

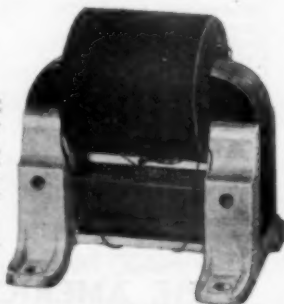
The "A-A" Power Tube Socket

This socket is designed for use with the UV 203 and the C 303 50 watt power tube. A well made, nice appearing socket, with insulation designed to withstand 3000 volts. Socket and base shell are of brass with Bakelite strips containing binding post terminals. Shipping weight, 2 pounds.

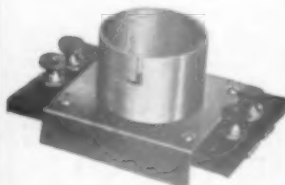
No. R-4 Power Tube Socket, price.....\$3.00

**ALL-AMERICAN
ELECTRICAL MFRS.**

1516 N. Lorel Ave., Chicago, Ill.

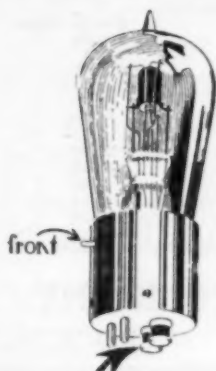


TYPE R3 SEMI-MOUNTED



WHY TAKE CHANCES

?



Carrying Capacity

$\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$,
2, $2\frac{1}{2}$, and 3
amperes.

Order By Mail

If your dealer cannot supply you with "RA-DECO" Safety Fuses pin one dollar to this advertisement, stating sizes wanted, and receive four fuses by return mail.

How To Protect Your Vacuum Tubes

Blame yourself—not the tube—when an accidental short wipes out your Vacuum Tube at a sacrifice to money, time and efficiency.

With a Radeco SAFETY FUSE on the filament terminals of any standard bulb, you end unnecessary Vacuum Tube losses.

Radeco SAFETY FUSES operate like any ordinary fuse. Any high amperage circuit is broken before it can reach and destroy the delicate filaments.

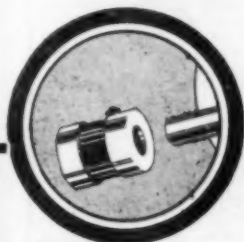
SIMPLE Slips directly on the filament terminals. It's easy. Efficiency guaranteed. Radeco SAFETY FUSES are equally necessary for protecting meters and other sensitive instruments. Equip your set at once.

We sell standard Radio equipment of every description. Order from any standard catalog. Immediate deliveries

Radio Equipment Co.

630 Washington St.

Boston, Fourth Floor Mass.



Patent Pending

"RADECO" SAFETY FUSE

Don't wait until your Vacuum Tube blows out before you apply Radeco SAFETY FUSES to your tubes. Today—now—avail yourself of this tube insurance.

Sold by dealers

4 for

\$1.00

A RELIABLE MAIL ORDER HOUSE— THE KARLOWA RADIO CO.

Radio Telephone & Telegraph Apparatus

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TRESCO PRODUCTS

AMERICAN RADIO & RESEARCH CORP.

VICTORY "B" BATTERIES

FAMOUS "K" LINE PRODUCTS

Our 55 page catalog will be sent upon receipt of 5c in stamps, CW catalog for 4c, or both for 7c.

Special Reductions on New and Used Apparatus

(All covered by our refund guarantee)

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U—1 K.W. Hytoms Transmitter	500.00 "	200.00
N—Corwin H.R. 180 degree knobs and dials		.95
U—Kermal 0-15 R.F. Ammeter	\$14.00 value	5.00
U—General Radio Variometer	24.00 "	6.50
U—C.E. Long Wave Coupler	45.00 "	15.00
N—Century High Frequency Buzzers	2.50 "	2.00
N—43 plate Blitzen Variable Condensers	5.75 "	3.00
N—K20a Enclosed Rotary Gaps	25.00 "	16.95
N—K20b Enclosed Rotary Gaps	20.00 "	13.95
N—D101 Galena Detectors	2.60 "	1.65
N—Amrad 1 K.W. Quenched Gaps	30.00 "	22.50
U—DeForest Interpanel Receiver Tuner, Audion, and 2 Step	93.50 "	63.50
N—Tuska CW Inductances		Half Catalog Prices

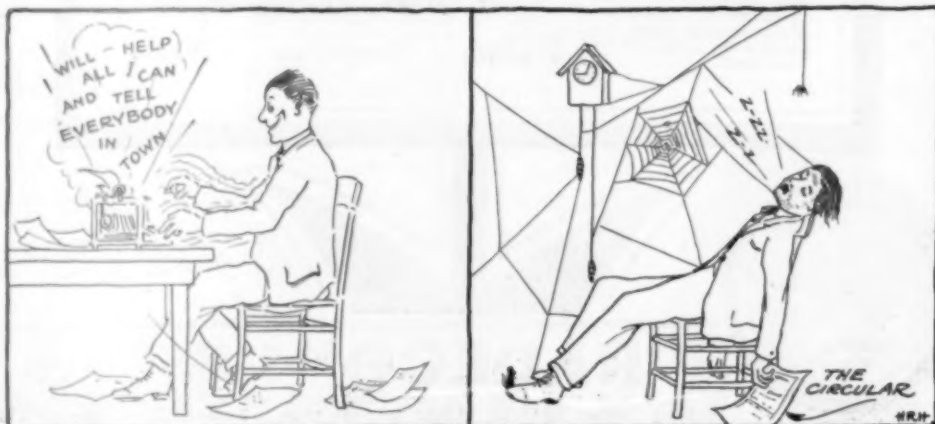
(U—refers to used apparatus, and N—to new. All used apparatus is guaranteed as good as new both as to finish and working qualities.)

KARLOWA RADIO COMPANY

BEST BUILDING,

ROCK ISLAND, ILL.

When we sent out that circular regarding the
Third District's Own Convention
We found that there are
Two Classes of Third District Radio Men



P.S.—If you didn't get a circular, or if you lost it, write to S. Kruse, 2637 Garfield St., N. W. Washington, D.C.



The Name "SIGNAL" on Radio Apparatus Is the BEST Indorsement

SIGNAL RADIO APPARATUS pleases the amateur because it is built to the exacting requirements of the professional radio-electrician. And everybody knows "the man in the business" knows what he wants. SIGNAL LINE OF INSTRUMENTS is one of the oldest—and most complete; make sure by specifying "SIGNAL."

The "REASON" Signal C. W. Apparatus is the Best

U. S. NAVY *threw out* variometers. *We never used them. Why? Too critical in adjustment. Unsatisfactory in control. Unreliable in operation.*

U. S. ARMY *discarded* "capacity tuners." *We would not even try to use them. Why? Inefficient, the losses being too great, particularly at shorter wave-lengths.*

What We Do Use, and Why

Small inductance steps and small condenser valves, with calibrated controls, thereby combining the *best principles of two methods of tuning into one efficient system.*

"Signal" instruments get the "signals" always.



R-80 V.T. Control Cabinet

This is the first V. T. control unit on the market that is wired throughout in accordance with fundamental principles, and that has all binding posts marked correctly, as to use and polarity, so that the experimenter may make use of any circuit he chooses and get the maximum efficiency as well as accuracy and ease of control.

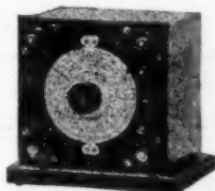
We use our new V. T. socket in this instrument, which will take any of the standard four-prong tubes on the market, either detectors or oscillators.

R-44 Primary Series Condenser

For the *best results and real satisfaction* in C. W. work, use our special condensers, with our new dial, equipped with wave-length scale, so that your set may be calibrated with your own aerial and ground system.

This allows close and accurate tuning, as well as the duplication of your settings, and makes your receiver serve as a wave-meter.

No other apparatus on the market has this feature to offer.

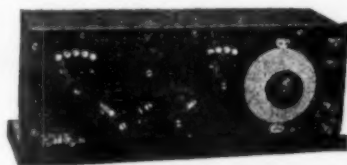


R-37 Short-Wave Tuner

This instrument is the most efficient short-wave tuner on the market, being designed on scientifically correct principles.

We use special H. C. coils, with taps at the proper points for controlling the wave-length range, and a small condenser with just enough capacity to cover the steps of inductance. This combination is free from the inherent defects of tuners using either inductance, alone for tuning, or capacity alone, and the results obtained with this tuner, as well as its ease of control, are remarkable.

There is more "Radio" value in "Signal" apparatus than any so far produced for the money.

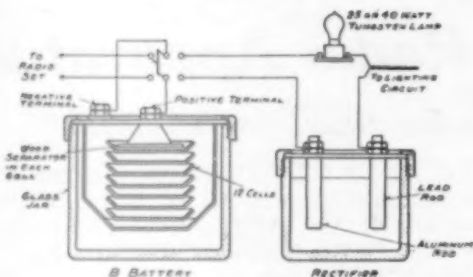


You should have the SIGNAL WIRELESS catalogue.

Write for it today; it's free. Address

SIGNAL ELECTRIC MANUFACTURING COMPANY
Menominee, Michigan

Important Announcement



Due to large quantity production we are enabled to greatly reduce the price of our Storage B Battery. Can you longer afford to be without one?

NO ACID REQUIRED

Battery is shipped ready for use except that a small amount of distilled water must be added.

ATTRACTIVE APPEARANCE

22 volt unit in heavy glass jar 4 inches diam.

LIFE AND PERFORMANCE

It will outlast several dry batteries and its performance is a real satisfaction. EASILY CHARGED from a.c. lighting circuit using the McTighe or other rectifier.

SATISFACTION GUARANTEED

BATTERY COMPLETE	\$3.50
RECTIFIER	\$1.25

Postage and packing 20c extra

McTIGHE BATTERY CO., Wilkinsburg, Pa.

IT'S HERE AT LAST

A RECEIVER, FOUR-STEP RADIO FREQUENCY AMPLIFIER
COMBINED IN ONE CABINET 19" LONG, 9½" HIGH
MAKE COAST-TO-COAST AMATEUR RECEPTION A COMMON
THING

Has a wave-length range of 175-625 meters but other wave-lengths can be readily adapted. Highest grade materials used throughout.

Special Price This Month Only to Introduce.....\$118.00

INCLUDING FIVE SPECIAL AUDION TUBES
WRITE FOR DESCRIPTIVE LITERATURE

Industrial Radio Service, Newton & Rust, Saginaw, Mich.

WE "PICK UP" YOUR S. O. S.

for any apparatus from a complete station to a 3-cent contact point.

Radiotron Tubes.....	\$5.00
Paragon Rheostats No. 25.....	1.75
Chelsea Dials 3¼".....	1.00
Tested Galens.....	.20

Write for list.

INDIANAPOLIS RADIO SUPPLY CO., Dept. B
3023 Boulevard Place, Indianapolis, Ind.

Everything for the Amateur

Small Storage Batteries for Audions
Cells—any size, from pocket flashlight battery cell up.

Ask for circular.

Galveston Wireless Supply Co.
GALVESTON, TEXAS

THE OTHER DAY WHEN I WAS COMING HOME FROM THE RADIO SHOW I HEARD SOME FELLOWS SPREADING SCANDAL SAYING THAT THE "C.R.L. Z NITH" REGENERATOR WONT OSCILLATE ON 200 METERS AND WERE RAZZING THE WHOLE SET IN GENERAL —



HE TOLD ME ALL ABOUT HOW THE VARIOMETERS ARE BALANCED WITH A 'DRIVER' — AN AUDION CIRCUIT WHICH OSCILLATES ON 180 METERS AND IS USED TO TEST THE VARIOMETERS USED ON THE 'REGENERATOR' —

AFTER THIS BALANCING HAS BEEN FOLLOWED OUT THERE'S NOT A POSSIBILITY OF ITS FAILURE TO OSCILLATE ON 180 OR 200



SO TO FIND OUT ABOUT WHAT WAS IN IT I WENT UP TO THE FACTORY AND LABORATORY AND MR. MATHEWS TOLD MR. HASSEL THE ENGINEER TO EXPLAIN THINGS TO ME —

ALL OUR VARIOMETERS ARE BALANCED WITH AN OSCILLATING AUDION CIRCUIT TUNED TO 180 METERS — THE CABINET IN FRONT OF ME IS CALLED A DRIVER —



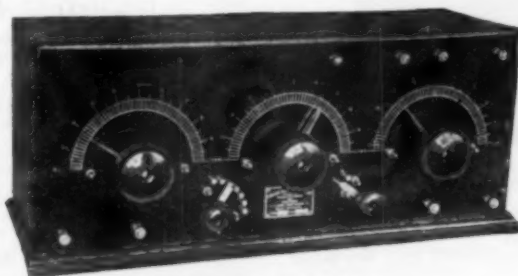
ALL THE FELLOWS WHO ARE STILL DUBIOUS CAN TAKE WHAT HASSEL SAID AND SET IT TO MUSIC — AN JAYO.M. WAIT TILL I MEET THAT KNOCKER — I'LL TELL HIM JUST WHERE TO GET OFF — THE REGENERATORS ALL THERE!



—The Squeak Box Pounder Visits the Chicago Radio Laboratory—

"200
Meters"

or ---



200
METERS

WHICH ?

The difference between a "200 meter set" and one which tunes to 200 meters lies in the intelligent and careful calibration and balancing of the inductances.

Every Z-Nith Regenerator is individually tested with a 180 meter audion driver and each instrument must respond to that wave before it passes inspection.

In these days of real 200 meter transmission, a set must actually tune to below 200 meters in order to give you the results you have a right to expect.

When in Chicago visit us and see how it is done.

Write for Bulletin F-21.

Chicago Radio Laboratory
6433 RAVENSWOOD AVENUE, CHICAGO, ILL.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

RADIO CITIZENS 40% discount!

The "Superlative Radio Co." and "A. K. Laing, Radio Supplies," have been merged into "A. K. Laing Radio Co."

The new company is prepared to give exceptional service at moderate prices. Our advertising appropriation is larger but mere space cannot convey the above service standards as a practical demonstration would.

Therefore we desire a satisfied customer in every radio locality, believing that his word of mouth advertising will be better than pages of display. To secure these customers we offer articles needed by every radio man at a discount seldom even granted to dealers. We expect to lose money, but we are not giving something for nothing, for this will be charged to advertising, and we believe it buys a more forceful type than "white space." In fairness to other dealers, we will only accept orders at these prices until our present stock is exhausted, so order early.

(Batteries guaranteed newly manufactured.)

ACE "B" BATTERIES

No. 623, small plain (list \$1.50) \$0.90

No. 625, large tapped (list \$3.00) 1.80

See ACE ad. in this issue for complete description.

Postage Extra.

A. K. LAING RADIO COMPANY, Pelham Manor, N. Y.

Quality Radio Equipment



Grebe CR-5 Regenerative Receiver

150-3000 Meters

Gives Real Results

A complete Receiver—only additional equipment needed are phones, batteries and detector tube. Includes in its range amateur, commercial and Navy wave lengths, special land stations, ship CW stations, Navy low wave area and "Time." Especially efficient for Radio phone and CW reception. Ease of operation unparalleled. **\$80.00**

SPECIAL Thordarson 1-KW Type R Transformers
Reduced because of overstock — **\$25.00**
Formerly \$40.00 — While they last

Full line of Radiotron Vacuum tubes and Accessories and other Highest Grade Radio Supplies

Mail orders promptly filled. Dealers, write for discount.

DOUBLEDAY-HILL ELECTRIC CO.

715 12th St., N. W., Washington, D. C. Radio Dept.—Desk A 719-21 Liberty Ave., Pittsburgh, Pa.

ARE YOUR FILES OF Q S T COMPLETE?

OFFER NO. 1: October 1916, May to August, 1917 inclusive, \$0.75 Postpaid.

OFFER NO 2: April to December, 1920, Inclusive, \$1.00 Postpaid.

OFFER NO. 3: January to April of this year, Inclusive, \$0.50 Postpaid.

ALL THREE OFFERS, COMBINED, POSTPAID FOR A \$2 BILL

Q S T, 1045 Main Street, Hartford, Conn.

MEYBERG

The Largest Radio Stock on the Pacific Coast

SAN FRANCISCO

Everything the
Amateur Wants



LOS ANGELES

Send for 32-page Remler
Catalogue—just off press

Stocks Guaranteed—Prompt Service From Either Address

VACUUM TUBES

C300 Cunningham Detector.....	\$ 5.00
C301 Cunningham Amplifier.....	6.50
C302 Cunningham 5 Watt Power.....	8.00
C303 Cunningham 50 Watt Power.....	30.00
UV200 Radiotron Detector.....	5.00
UC201 Radiotron Amplifier.....	6.50
UV202 Radiotron 5 Watt Power.....	8.00
UC203 Radiotron 50 Watt Power.....	30.00
Moorhead Electron Relay.....	5.00
Moorhead VT Amplifier.....	6.50
Moorhead VT Transmitter.....	7.50
Moorhead Rectifier Tube.....	9.75
All tubes postage postpaid.	

AMPLIFYING TRANSFORMERS

231A General Radio.....	\$ 5.00
226W Federal.....	7.00
A2 Acme-Unmounted.....	4.50
A2 Acme Semi-mounted.....	5.00
A2 Acme Fully mounted.....	7.00
UV712 Radiotron.....	7.00

EVEREADY BATTERIES

765 Small 22½ Volt B.....	\$ 2.50
766 Large 22½ Volt B.....	3.50
774 Variable 43 Volt B.....	5.00
746 Special 106 Volt Amp. B.....	16.50
6 Volt 40 Amp. hr. Storage.....	18.20
6 Volt 60 Amp. hr. Storage.....	20.80
6 Volt 80 Amp. hr. Storage.....	24.05

REMLER APPARATUS

Moulded Bakelite Variometers.....	\$ 6.00
503 Moulded Bakelite Variocouplers.....	5.40
100 3" Bakelite Dial and Knob.....	1.00
330 Detector Panel Moulded Bakelite.....	8.00
331 Amplifier Panel less Transformer.....	6.00
333 Amplifier Panel less Transformer.....	9.00
(with cam switch)	
810 Jr. Reostat.....	1.00
94 A Battery Potentiometer Unit.....	.75
74 Knob and Lever for above.....	.45
96 Variable Grid Leak.....	.60
97 Fixed Grid Condenser.....	.35
400 3 Coil Mounting on base.....	6.50
3 Coil Mountings for Panel Mtg.....	3.60

TELEPHONES

Brandes Superior.....	\$ 8.00
Brandes Trans-Atlantic.....	12.00
Brandes Navy.....	14.00
Baldwin Type C Navy.....	16.50
Baldwin Type E.....	20.00
Baldwin Type F.....	21.00
Murdock No. 55 2000 ohm.....	4.50
Murdock No. 55 3000 ohm.....	5.50

JACKS AND PLUGS

Federal 1421 open Circuit Jack.....	\$.70
Federal 1422 single Circuit Jack.....	.85
Federal 1423 double Circuit Jack.....	1.00
Federal 1435 Automatic Filament Control Jack.....	1.20

Federal 1438 Automatic Filament Control Jack.....	1.55
Western Electric Plugs.....	1.30
Federal Plugs.....	2.00
Pacent Universal.....	2.00

SOCKETS

No. 92 Remler Socket.....	\$ 1.50
No. 156 General Radio.....	1.50
No. 550 Murdock.....	1.00
No. R300 DeForest.....	1.60
De Forest Moulded Bakelite.....	1.40

VARIABLE CONDENSERS

No. 230 Wireless Shop Panel Mtg. .0005.....	\$ 3.60
No. 430 Wireless Shop Panel Mtg. .001.....	5.25
No. 630 Wireless Shop Panel Mtg. .0015.....	7.50
No. 1 Chelsea Mtd. .0011.....	5.00
No. 2 Chelsea Mtd. .0006.....	4.50
No. 3 Chelsea Unmtd. .0011.....	4.50
No. 4 Chelsea Unmtd. .0006.....	4.00

REGENERATIVE RECEIVERS

Mycro D12 175 to 25000 meters Detector	
2-step Amp. less Coils and Tubes.....	\$165.00
CR3 Grebe Relay Special.....	68.00
CR3A Grebe Tube Control self-contained.....	47.50
CR5 Grebe 175-3000 meters tube control.....	85.00
CR6 Grebe 175-650 meters Det. 2-step.....	210.00
CR7 Grebe 5000-20000 Long wave	
Special.....	220.00

C. W. APPARATUS

JEWELL METERS

O-100 Milliamps Flush Mtg.....	\$ 8.00
O-250 Milliamps Flush Mtg.....	8.00
O-500 Milliamps Flush Mtg.....	8.00
O-15 Volts Panel Mtg. back-con.....	10.00
O-500 Volt Meter.....	16.00
O-1000 Volt Meter.....	23.00
O-1500 Volt Meter.....	29.00
O-1, O-2, O-2½, O-5, Thermo coupled	
Radiation Meter Flush Mtd.....	12.00

MOTOR GENERATORS

Westinghouse 100 Watt 110 Volt 60 cycle	
AC 500 Volt DC.....	\$ 80.00
Westinghouse 250 Watt 110 Volt 60	
cycle AC 1000 Volt DC with 87 Volt	
Grid Bias Tap.....	142.50
Pacent Universal CW Condensers, any	
capacity.....	2.00
CW Tuning Inductance.....	8.00
Variable Grid Leak 8000 ohm.....	3.00
Wireless Shop Condenser .0008.....	9.00
231M Modulation Transformer.....	5.00
Kellogg Transmitter.....	3.50
Kellogg Transmitter, adjustable arm.....	4.75
IMF-21AA Western Electric Filter Con-	
denser.....	2.75
Double Filter Choke.....	6.60

Send For Your Copy of New 32-Page Remler Catalogue Just off Press. DEALERS:
Our Stock Guarantees Service. Send For Special Co-operative Plan.

LEO J. MEYBERG CO.

428 Market Street
SAN FRANCISCO, CALIF.

752 South Los Angeles Street
LOS ANGELES, CALIF.

MAGECO

Moulded Variometer \$6.50

For Table or Panel Mounting

This variometer was on display during the Chicago Radio Convention and proved a great sensation, owing to the wonderful quality of workmanship and materials used. It was thought heretofore that it was not possible to produce a Variometer of this quality at such a remarkably low price.

The remarkable growth of the Marshall-Gerken line is due to a keen understanding of the demands of the most exacting user.

Our Mageco Variometer Types M. V. G. and M. V. P. are moulded composition, highly polished—which makes each part accurate to the thousandth of an inch. The windings are moulded right into the forms, are wound with green silk wire No. 22 for Grid and No. 20 for Plate and are not shellacked, thereby reducing the distributive capacity to a minimum.

The clearance of $\frac{1}{16}$ of an inch between the rotor and stator gives a distributive capacity lower than any other type.

Another feature of this variometer is the simplicity with which it can be mounted on a panel, and four screws on front of stators provide the necessary means for mounting. Size $4\frac{1}{2}$ in. x $4\frac{1}{2}$ in. x $2\frac{1}{4}$ in. wide.



If your dealer does not carry them, write us, giving his name.
Dealers: Orders at once—the demand is big.

The Marshall-Gerken Co.

Manufacturers and Jobbers

130 RADIO BLDG.

TOLEDO, OHIO

Antenna Insulators

Will stand 500,000 volts after immersion in water for 48 hours. Tensile strength 2,000 pounds.

Longer Than the Insulator Sold as 10"
Stronger Than the Insulator Sold as 10"

AND ONLY 90c APIECE

This price for August and September only.
Buy 'em now for your new aerial.

Burgess #4156 22½ Volt "B" Batteries
\$1.75 Each

While they last—Limited Supply.

"73" Puncture Proof C.W. Condensers

1 Mfd 1500 Volts.....	\$4.00
2 Mfd 1500 Volts.....	5.00
5 Mfd 1500 Volts.....	10.00
2 Mfd 2500 Volts.....	15.00
2 Mfd 4000 Volts.....	23.00
5 Mfd 2500 Volts.....	30.00

Write for descriptive Circular.

The Radioelectric Shop Co., Dept. Q. 10
919 Huron Road Cleveland, Ohio

OMAHA

Now has a good Up-to-Date stock of

WIRELESS

Apparatus and Supplies.

We are AMRAD stock dealers

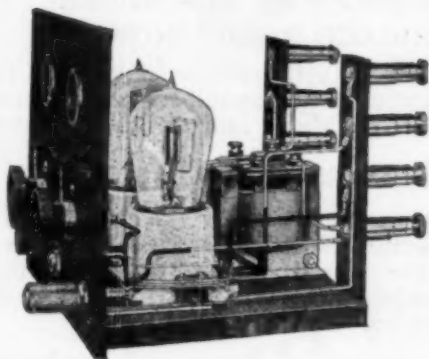
also a good line of Aerial Equipment, A.A. Transformers, Brandes, Baldwin, DeForest, Federal, Firth, G. A., Murdock, Radio Corp., Remler and Thordarson Apparatus and parts.

Genuine Bakelite Panels cut to any size, in $\frac{1}{8}$ ", $\frac{1}{4}$ " and $\frac{1}{2}$ " thickness at 2c, 3c and 4c per square inch.

WOLFE ELECTRIC CO.

313-S. 17th St.

Phone Atlantic 1414

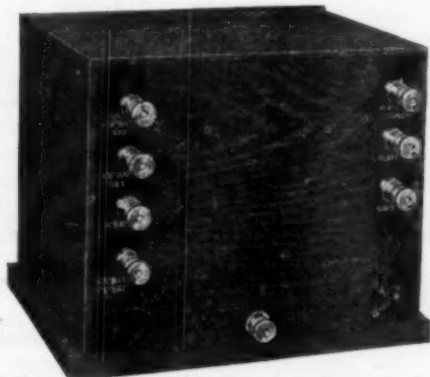


THE CABINETS are constructed of selected quarter sawed oak; stained inside and out; waxed and hand rubbed. PANELS are of grade M $\frac{3}{4}$ in. Formica, $6\frac{1}{4}$ in. high; grained finish. They are attached to drawer shelf, permitting complete assembly to be instantly removed and used without cabinet if desired. FILAMENT CONTROL RHEOSTATS are of approved type.

TELMACO SPECIAL BINDING POST CONSTRUCTION, is used throughout, entirely eliminating all wiring from the front of the panel. AMPLIFYING TRANSFORMERS are of new type, designed to operate with maximum efficiency with the new type tubes. We furnish transformers FULLY MOUNTED.

The GRID CONDENSER and VARIABLE LEAK are wired in the detector circuit, the latter on the front of panel. SOCKETS are of high grade construction to fit tubes having standard four prong bases. LETTERING on panel is pantograph machine engraved and filled with best grade of white enamel.

FULL AUTOMATIC FILAMENT CONTROL JACKS are wired into these amplifiers. RADIO PLUG is furnished with the above.

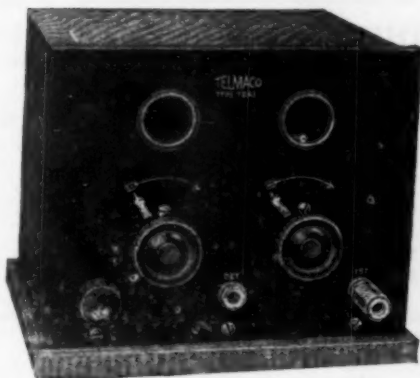


DEALERS! We are distributors for nearly all Standard Lines. Write for our Special Proposition.

TELMACO

The Big Hit

at the Radio Show
Telmaco Vacuum Tube
Detectors and Amplifiers
The very best that skill and experience can produce



PRICES

TYPE TD-1 TELMACO VACUUM TUBE DETECTOR UNIT.....	\$15.00
TYPE TDA-1 TELMACO DETECTOR AND SINGLE STAGE AMPLIFIER UNIT	\$35.00
TYPE TA-2 TELMACO TWO-STAGE AMPLIFIER	\$40.00
TYPE TDA-2 TELMACO DETECTOR AND TWO-STAGE AMPLIFIERS	\$45.00

Order Direct From This Ad

Satisfaction guaranteed always or money refunded. Send for our complete, new catalog "T." You'll find it interesting; it describes everything in Radio.

Your panels engraved with our GORTON ENGRAVER. Price right.

Radio Division
Telephone Maintenance Co.
17 N. LaSalle St., Chicago, Ill.

C.W. TRANSMISSION GIVEN A BOOST BY OUR TUNER THE SENSATION OF THE CHICAGO RADIO SHOW

Many of us were holding off installing C.W. sets because it seemed it was not going thru. Variometer Reception and capacity effects were a draw back. Our new Tuner solves all problems and C.W. sigs sure fill the air.



C.W. TUNER—TRESCO MODEL

Complete with 2 Cond. \$30.00 wt. 6lb
Tuner without 2 Cond. \$15.00 wt. 4lb
Tuner for panel mtg. \$10.00 wt. 2lb
Since making this cut we have added
Knobs to our Tickler Coils.

For description of Tuner and Hook-up
see QST June, 1921, read first article.

THIS TUNER WILL BE IN 5 ENGLISH AMATEUR STATIONS when our American amateur goes there to receive our spark and C.W. sigs. Watch the results.

ANNOUNCEMENT EXTRAORDINARY

We will ship prepaid one of the \$15.00 type of tuners to any relay-man member of A.R.R.L. with 2 years experience, on receipt of letter from your Dist. Supt. stating you have had this experience. 10 day free trial allowed.

Spark and C.W. come in equally well. Absolutely no capacity effects. Coil oscillates on one turn only of primary. Ticklers set once for each aerial then seldom touched. Orders shipped in rotation. Our 24 page catalog sent you for 10 cents.

TRESCO, DAVENPORT, IOWA

RADIO DEALERS

Send us your name and address for our illustrated Bulletins and Discount Sheet.

We have an attractive proposition for you.

THE RADIO ELECTRIC COMPANY

3807 FIFTH AVE., S.

PITTSBURGH, PA.

Get a Copy of Our Wireless Manual H-12



It contains 200 pages, fully illustrating and describing the many instruments used in Radio service. Forty-five pages are devoted to general instructions, diagrams, station calls, tables, codes and other information identified with the art. The book is printed on highly finished paper with a two-color cover; size 8x5 1/2 inches.

We ask 25 cents for it, give a coupon receipt for the amount which coupon when returned with an order will be credited at 25 cents.

With a large and varied supply of wireless instruments and accessories carried in stock, we are in position to fill any order or meet any condition promptly and accurately.

We have experts in charge of our wireless departments, so do not hesitate to consult us about your wireless problems. Proper attention and accurate information is yours for the asking.

MANHATTAN ELECTRICAL SUPPLY CO., Inc.

17 Park Place, New York; 114 So. Wells St., Chicago; 1106 Pine St., St. Louis; 604 Mission St., Frisco.



**EASTERN
RADIO**

INSTITUTE

**899 BOYLSTON ST.
BOSTON, MASS.**

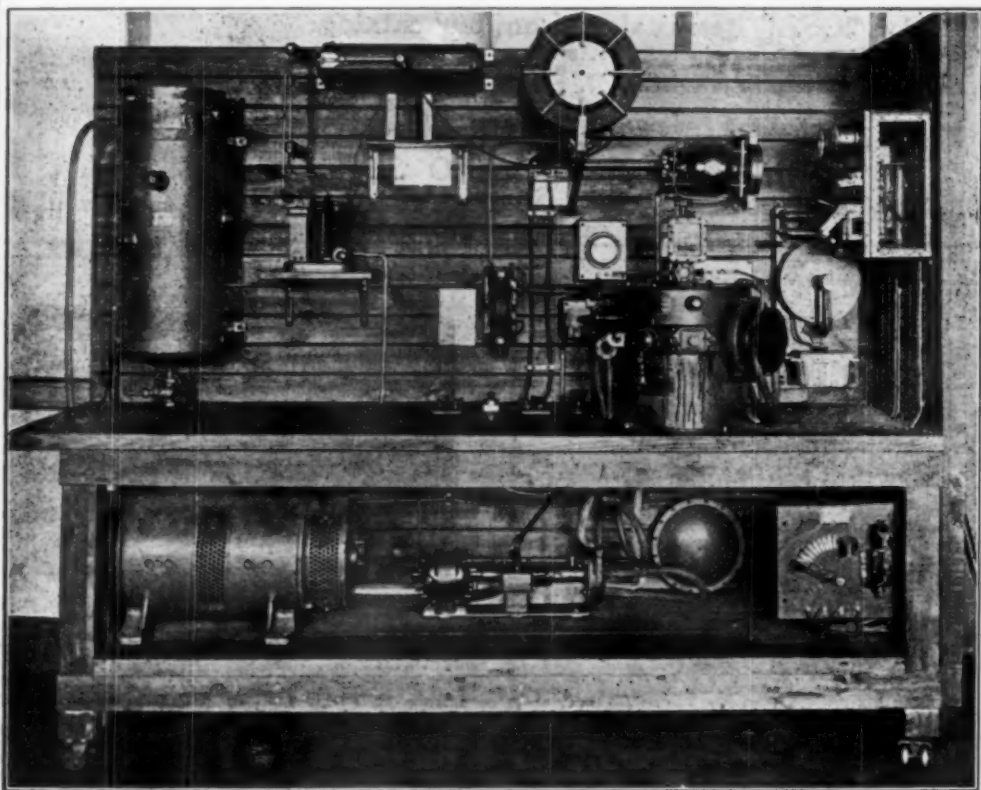
**TEL.
BACK BAY
5964**



SPARK---A R C---VACUUM TUBE

The Revised Examination for Commercial Operators including ARC and VACUUM TUBES is carefully and fully covered by the Course of Instruction offered by the EASTERN RADIO INSTITUTE.

Intelligent students INSIST on being taught upon ACTUAL apparatus!



"The EASTERN RADIO INSTITUTE'S 2 K.W. 'ARC' "

The EASTERN RADIO INSTITUTE is the OLDEST, LARGEST and BEST EQUIPPED Radio school in New England. The Pioneer school that has always led the way! Ask any man in Radio—he will tell you!

New Students can begin to advantage in the Day or Evening school on any Monday.
REMEMBER:—Our ORGANIZATION with YEARS OF PHENOMENAL EXPERIENCE and SUCCESS is behind every man who enrolls! Ask any man in Radio—he will tell you! OVER 4000 satisfied graduates TELL OUR STORY BEST! Why not be one?

Our illustrated prospectus is free. If you cannot visit the Institute send for one.

F. D. PITTS, Director

THE "QSA" LINE OF RADIO EQUIPMENT



QUALITY—in the apparatus we sell, is an essential part of our dealings with you. Here is a panel mounting rheostat which, from the standpoint of quality, well deserves a place in our "QSA" line. Base of Thermo-plax (2½" dia.), polished nickel-plated pointer, and bakelite knob. Resistor unit wound to 6 ohms and will safely carry 1½ amperes.

A very high grade rheostat, reasonably priced at only \$1.25 each.

Our Catalog

—is now ready. You can't afford to be without it. It lists the cream of apparatus made by the leading Radio Manufacturers. Each item a leader in its class, carefully selected by our expert. You will find it fills the gaps left by other catalogs. Generously illustrated. Don't do any buying until you see our catalog. You'll be glad we tipped you off. Sent for 10 cents in stamps. This amount will be refunded on your initial purchase amounting to \$1.00 or more. Send for it TODAY.

A few "QSA" items taken from our catalog:

U.V. 712 Intertube Transformer.....\$7.00
U.V. 201 V.T. Amplifier..... 6.50
FADA Detector comp. with crystal..... 2.50

Acme 1 K.W. Spark Transformer.....\$28.00
Acme Amplifying Transformer..... 5.00
Brandes Navy Type Phones..... 14.00

"COMBAT" 6V. 80 A.H. a real STORAGE BATTERY for RADIO WORK. This month only at \$21.00

Ask for a "COMBAT" circular

INDEPENDENT RADIO SUPPLY CO.

3716 W. Douglas Blvd.

Dept. H-10

Chicago, Ill.

"BETTER RESULTS WITH LESS EFFORT"

Prepared Radio Measurements

with
Self Computing Charts

by Ralph R. Batchelor

A new WIRELESS PRESS book. Published as a real help to amateur radio. Obviates the necessity of long and involved mathematical calculations. A ruler or transparent triangle takes the place of intricate figuring and the results will be correct every time.

PRICE \$2.00

The WIRELESS AGE

The magazine that meets
all your expectations.

When its new you find it in the AGE. Every step in radio progress is fully and carefully described. You miss a lot of good things unless you read the AGE. \$2.50 per year, Postage outside U. S. 50c.

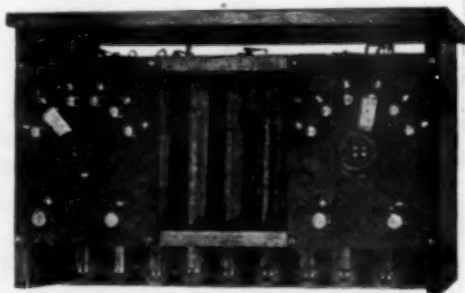
SPECIAL OFFER ONLY

Prepared Radio Measurements & The Wireless Age 1 Year \$4.00
Outside U. S. 50c. Extra

This offer expires Dec. 15, 1921.

WIRELESS PRESS INC.

328 Broadway, New York



"B" BATTERY TROUBLES ENDED

Our STORAGE "B" BATTERIES give years of REAL service and save you REAL money in the end. One charge will last from three to six months while in the detector plate circuit and they can be recharged in about two hours. The plates cannot sulphate or buckle and are not harmed from short-circuiting, overcharging or standing idle.

Two styles are supplied, one as illustrated, with control panels allowing adjustments of 1.35 volts from fifteen volts up, and the other plain with clips for adjustment. Rectifiers for charging, chemicals and directions are included with each style. All that is needed to put the battery into service is about one quart of distilled water.

The following prices are for batteries with control panels.

24 cell 32 volts.....\$10.00
36 cell 48 volts..... 12.00
50 cell 68 volts..... 15.00

The following prices are for plain batteries with clips for adjustment. 32 volts, \$8; 48 volts, \$10; 68 volt, \$12.

Send in your order today with the privilege of receiving money back if not satisfied after sixty days trial. Further information upon request.

KIMLEY ELECTRIC COMPANY

290 Winslow Ave.,

Buffalo, N. Y.

RADIO APPARATUS

*Distributors of Reliable Radio Apparatus to Schools, Colleges,
Radio Clubs and Experimenters All Over the World!*

"PITTSCO"

Service on "Grebe Radio" is
International! Send us your
ORDERS for this apparatus
of PROVEN MERIT!



"PITTSCO"

Service distributes RADIO
CORPORATION'S products
all over the world! Send us
your ORDERS today!

AMPLIFYING TRANSFORMERS

No. UV-712 Radio Corporation, new type, very efficient	\$7.00
No. 231-A General Radio, new model..	5.00
No. A-1 "Saco-clad," shielded type.....	5.00

AUDION CONTROL PANELS

No. RORA Grebe in cabinet, with hinged cover, splendid value.....	9.95
No. RORH Grebe in cabinet, with cover and tickler connections.....	17.00
No. 70 Paragon, moulded type.....	6.00

"B" BATTERIES

No. 7623 Standard 22.5 V. small.....	1.50
No. 7625 Standard 22.5 V. large.....	2.65
No. 7650 Standard 22.5 V. variable....	3.50
No. 766 Everready 22.5 V. large.....	3.50
No. 766 Everready 22.5 V. variable....	3.00
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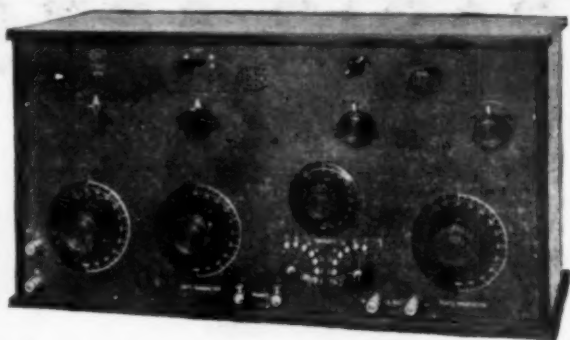
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Ball Bearing—42 Segments in
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PARTS: Exactly as used in above
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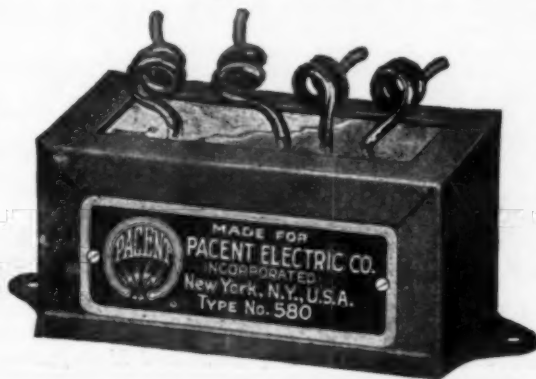
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Type No. 580

Made in Single Capacities

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0.005
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Price - \$4.00



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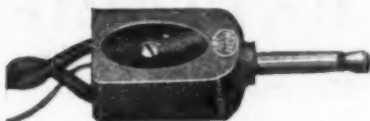
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5,000 volts
4 amperes

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This latest addition to the already remarkably complete line of the Dubilier Condenser Company will meet a long-felt want of all amateurs interested in CW Transmission. The #580 condenser is extremely compact, is of rugged construction and the losses are infinitesimal.

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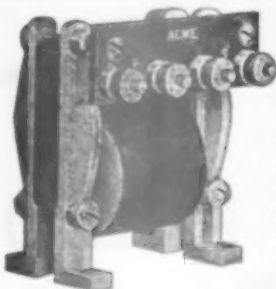
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The impedance should be approximately equal to the tube circuit.

The distributed capacity of windings should be reduced to a minimum.

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A core type transformer is not affected by stray fields any more than any other type.

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We use a paper layer wound coil thoroughly impregnated

The best of materials are used throughout

No soldering flux is used in the coil

The greatest care is exercised in the manufacture and testing.

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The surplus materials the Navy has available for sale have
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Blankets.	Machinery.	Stationery and
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Brass.	(Kitchen and	Tin.
Canvas and Tents.	Dining Room.)	Tools — Hand, Ma-
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Copper.	struments of	Zinc.

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Magnavox Electrodynamic Receivers are limited only by their construction and electrical constants in the amount of power they will convert into sound. Therefore we have rated them according to the input they can receive and successfully turn into sound—either from signals or from Radio telephone speech or music.

The Type R-3 Radio Magnavox Is a 5 Watt Instrument at \$45
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This also means that with their rated input the Type R-3 may be heard $\frac{1}{2}$ mile under good conditions, and the Type R-2 be heard $1\frac{1}{2}$ miles under the same conditions.

The way to get a power input to utilize the enormous converting characteristics of Magnavox is to use from 100 to 500 volts on the plate of your two stage amplifier—then you will hear your signals with a strength not approached by any other type.

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OAKLAND, CALIFORNIA.

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Add 4c for Postage

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Postage and packing 10c.

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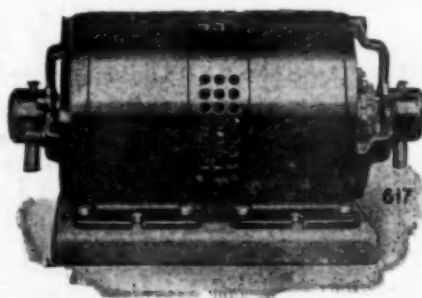
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Generator	37.50

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Generator	45.00

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—the amplifier used by the
U. S. Navy. "Use the tube
the Navy uses." Price \$6.50

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623	Variable	2½x2x3¾	22½	1	5	1.75
625	Plain	3 x4x6¾	22½	5		2.50
625	Variable	3 x4x6¾	22½	5	5	3.00
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Write for Cat. #20

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"Rugged Construction"

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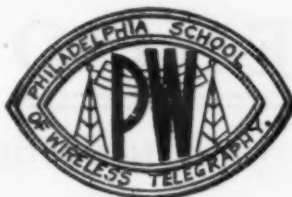
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7x22 tinned copper
100 feet 2 lbs.....\$1.25
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6 pounds

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Corwin No. 2......55
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Meters..... 65.00
No. CR-3A Grebe With tube control,
175-375 Meters..... 45.50
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3,000 meters, tube control, self-contain-
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Meters including detector, Just out.... 80.00
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circuit and design..... 65.00

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UV-202 Radiotron 5 W. power..... 8.00
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Murdock 367..... 4.75
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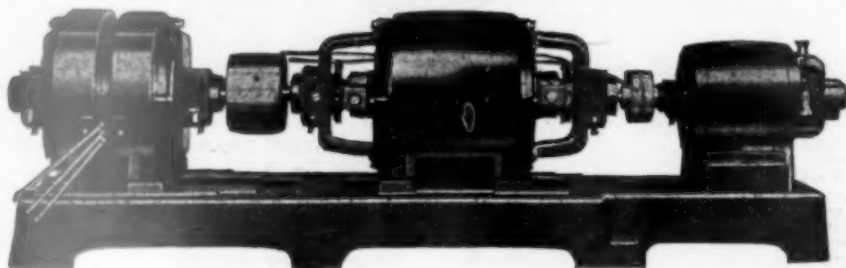
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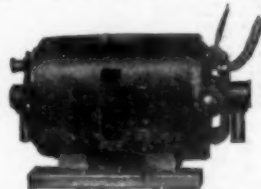
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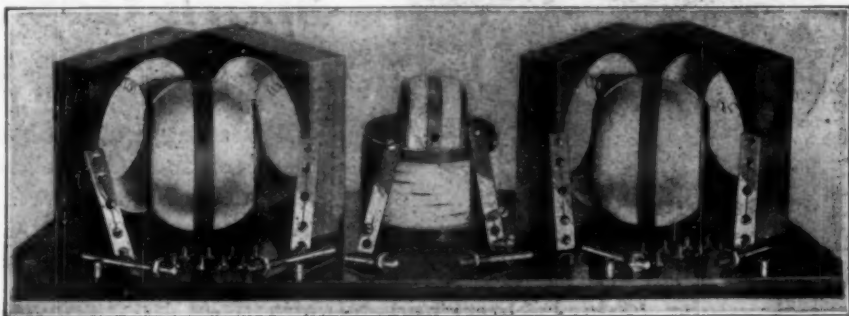
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 U.V.-200, \$5.00 U.V.-201, \$6.50
 Audiotrons, \$6.00 U.V.-202 \$8.00
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STERLING ELECTRIC CO.

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Famous "Chi-Rad" K-D Variometer Set



All parts to build two variometers and one coupler: ALL WINDINGS IN PLACE—nothing to do but screw on bearings and connect up. Complete set can be assembled in 30 minutes. The biggest value on the market—order a set today. Immediate Delivery.

Price complete as shown \$10.00 Add PP on 6 lbs.

Specifications

Variometer forms 4 $\frac{1}{4}$ " Sq., 3" wide when assembled. Coupler primary Bakelite 3 $\frac{1}{2}$ " diam., 3 $\frac{1}{4}$ " high. All shafts $\frac{1}{4}$ " diameter. 7 Primary Taps. Range 150-475 meters. Special condenser to shunt secondary and increase range to 650 meters supplied for 35c extra.

Made specially for panel mounting—all screws covered by dials when assembled.

Immediate Delivery—Money Back Guarantee.

We Originate—Others Imitate

Do You Know We Were First:

To sell Knocked-Down Variometer forms with all windings in place?

To bring Variometer prices down to a reasonable figure?

To offer real Solid Mahogany Forms wound with No. 18 and No. 20 wire?

To fully guarantee results obtained after assembly?

Due to the great popularity of "Chi-Rad" Variometers they are being imitated. For your protection our name appears on every instrument. Accept no substitutes—insist on "Chi-Rad" Mahogany Variometers—your dealer will get them for you.

DEALERS:—Write for attractive discounts on "Chi-Rad" Variometers. We are also jobbers for all standard lines of Radio Apparatus, why not buy all your Radio material from one old, reliable house and get full dealer's discount plus "Immediate Delivery" from Chicago stock? Write for full information.

CHICAGO AMATEURS:—Come and inspect our new stock—largest and most complete in the Middle West.

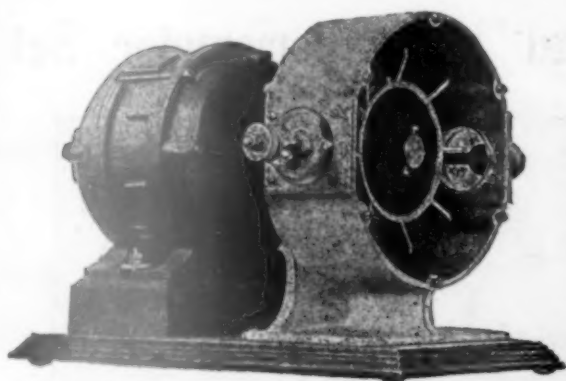
Chicago Radio Apparatus Co., Inc.

Phone Harrison 1716

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"Sole Chicago distributor FIRCO Radio Equipment"



You Tell 'Em Spark Gap... BENWOOD

Ball Bearing motor Aluminum Housing, Green glass insulation. Removable point disc. Absolutely vibrationless.

The Benwood Rotary Quenched Synchronous Spark Gap.

The Finest Gap on the market at the very lowest price. Listen to these gaps "working distance" every night.

PRICE AS SHOWN \$65.00 GAP ONLY \$28.00 MOTOR ONLY \$32.50

Write at once for new BENWOOD descriptive literature of the new large sized Benwood Gap, Disc 11" diameter.

THE BENWOOD COMPANY, Inc.

1300 Olive Street,

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CANADIAN AMATEURS!

Send ten cents for our big illustrated catalogue and a copy of Canada's First All-
Radio Magazine

**CANADIAN
— WIRELESS**

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SOMETHING NEW

THE PARKIN DIAL TYPE RHEOSTAT (Pat. pending) consists of a 3" molded Bakelite dial, in the back of which is a circular groove containing the resistance element. This groove, being recessed, allows the dial to clear the panel by the usual distance of $\frac{1}{16}$ ", an off position is provided, and a stop on the dial engages the stationary contact at the extreme positions. The 360 degree rotation insures fine adjustment. A brass bearing insures a true running dial and smooth action.

All figures and graduations are filled with brilliant white enamel. All brass parts nickel plated. Bakelite knob. Resistance is 5 ohms, carrying capacity 2 amps.

No. 77 Parkin Dial Type Rheostat

Postpaid \$1.75

FOR SALE BY ALL LEADING DEALERS

Send for free catalog No. 4 describing our complete line.

DEALERS: Write for proposition.

PARKIN MFG. CO., San Rafael, Calif.

'A JOURNEY of a thousand miles',
said Lao Tzu, 'begins with a
single step!'

"Let a Grebe Receiver be the first
step of your radio-journey—lest you be
compelled to return and start anew."

Doctor Wu



The CR-9 Receiver is the ideal equipment for
C.W. and radiophone reception.

A Regenerative Receiver—150 to 3000 meters—
moulded variometers, tapered-grip dials, rub-
ber-tired verniers, direct-reading rheostat con-
trols, automatic plug and jack filament con-
trol system.

So simple to operate—connect antennae, ground,
batteries—insert tubes—and *listen!*

Ask your Dealer to show you this instrument or
write us for descriptive bulletin.

A. H. GREBE & CO., Inc.

74 VAN WYCK BLVD.

RICHMOND HILL, N. Y.

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The Right Kind

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Buy This \$27.50



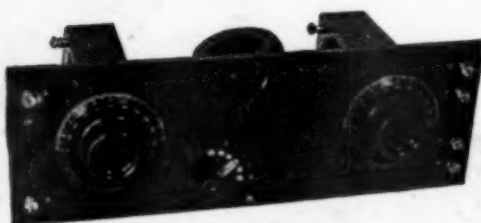
TYPE 223

- 2 Pair Variometer Brackets 0.70
- 1 Switch..... .35
- 6 Switch Points..... .35
- 6 Binding Posts..... .72
- 10 Feet Connecting Wire.. .08

Total\$30.20

- 2 Tuska Variometers.....\$12.50
- 2 Tuska Dials..... 3.00
- 1 Tuska Variocoupler.... 7.50
- 1 Drilled and Engraved
Panel 5.00

Make This \$27.50



TYPE 223

The C. D. Tuska Company,
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A marvelously easy to understand instruction book on most advanced radio methods, because it describes in detail the unusual mechanical and electrical features and simplicity of the complete ABC line.

Sixteen pages, clearly illustrated, in two colors. Every price quoted in this catalog represents a new low level for apparatus of recognized quality. Send 10c for latest ABC catalog "Professional Radio Equipment at Amateur Prices." Request Catalog CQ. 10.

WIRELESS EQUIPMENT CO. Inc.
32 Austin Street, Newark, N.J.

The Jupiter News

October, 1921

"Jupiter" Magnet Wire

Stock up. It's S.C.C. and the price is very low.	Size	1/4 lb.	1/2 lb.	1 lb.
	20	.30	.45	.80
	22	.35	.55	.95
	24	.40	.65	1.05
	26	.45	.80	1.25
	28	.50	.90	1.55

"Jupiter" Aerial Wire

seven strands No. 22 solid copper. Strong and flexible. Highest conductivity.
100 ft. \$1.25 1000 ft. \$9.00
500 ft. \$6.00
Shipping wt. 15 lbs. per M ft.
Be sure and send postage.

"Jupiter" Special

A larger size Jupiter for the efficient relay station.
Double strength and Conductivity.
2c. per ft. \$15.00 per M ft.
Shipping weight 24 lbs. per M ft.

"Jupiter" Service

is like lightning. It strikes you that we deliver promptly, well packed dependable radio supplies.

"Jupiter" Bargain Bulletin

contains list of radio supplies that will interest you. Send stamp for it at once.

The Lee A. Bates Company
Jupiter Radio Products
WORCESTER, MASS.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS



THE TYPE JX A.C. METER

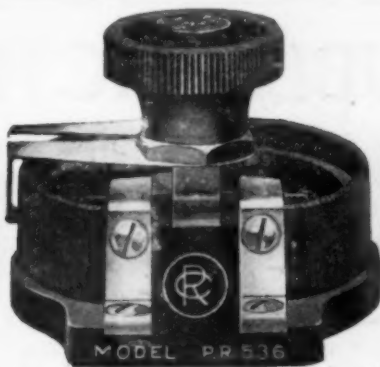
This is a comparatively new meter, brought out to be used in conjunction with the RADIOTRON power tubes. By the use of the proper voltage and current in the filament heating circuit, the life of the tube can be prolonged from two to three times, and the meter, used to determine the proper constants, becomes a valuable investment indeed. The use of alternating current is recommended by our radio engineer, as it provides for an even potential on each point of the filament and reduces chance surges to a negligible factor. Since the flow of electrons, from filament to plate reduces the diameter of the filament, the resistance changes and the required current value changes accordingly—Hence it is evident that where but one meter is used in this circuit, a voltmeter is preferred. Maximum filament life is obtained by keeping the potential within 3% of rated value. The movement of meter is that of a large instrument, redesigned in an ingenious manner to fit a 3 in. dia. case, flange dia. is 3 1/4 in. The moving element is a magnetic iron vane, mounted between jeweled bearings, in relation to a coil of wire on a hard rubber spool. Stock Scale readings are:

0-10 Type JX A.C. Ammeter, \$6.00
0-15 Type JX A.C. Voltmeter, 8.00



IDEAL filter condenser \$2 postpaid.

ACME 75 watt fil. heating transformer, mounted, \$12; 150 watt mounted, \$16.



R.C. "A" BAT. POTENTIOMETER

The resistance of this unit is 200 ohms and will carry .2 of an ampere. The moulding is of asbestos-bakelite and may be mounted by means of screw holes near the shaft. By loosening a concealed set screw, the shaft may be removed and reversed for panel mounting. \$2.00 postpaid.



Why waste \$2 to save \$2? Get a \$4 Sorsinc Battery and end your battery troubles. (Include postage on 14 lbs.) 22 1/2 volts and will outlast your VT.

SOMERVILLE 2000 V. test CW condensers 75c each postpaid. .00025, .0005, .001 and .002 mfd. sizes available. A new dielectric and simplified construction makes the low price possible. SPECIAL—During 1921, \$4 will buy six of these handy units.

AT LAST, THE R.C. GRID LEAK for 5 watt transmitting tubes. 5000 ohms, with mid tap \$1.10.

OF COURSE WE SELL C-W-C's! Felix & Diehl Radio course, \$10.00—Hurry, only a few left.

DO WE HAVE TO MENTION THAT WE CARRY R.C.A. tubes and accessories in maximum quantity? Send US your tube orders, remembering that—if it's from Somerville Radio Lab., it's OK; If it's OK, Somerville Radio Lab., has it.

OUR IDEA OF NOTHING AT ALL IS PAYING MORE THAN \$1.25 for a rheostat when we can mail you a FADA RHEOSTAT at that price, postpaid.



TYPE JT RADIO FREQUENCY AMMETER

While a hot-wire expansion ammeter is satisfactory for indicating resonance and giving comparative current values, it cannot register the actual values consistently, because of the influence of temperature on the expansion element. The type JT thermo-junction element, registers the same throughout the year, and is accurate to within 8%, whereas an expanding wire ammeter may have error of 10% to 40% in actual practice. The type JT has a lower resistance loss than any similar priced radiation instrument.

The general case design and construction is similar to that of the Type JX meter, but the movement is of the D'Arsonval type of large size, and consequently very accurate. The thermo-junction which energizes the movement, is the best combination known to science, and will sustain a heavy overload. Stock Ranges are: 0-1 1/2, 0-3, 0-5 and 0-10 amperes. Price \$12.00

GUARANTEE: Each meter is guaranteed against mechanical and electrical defects for one year from date of purchase, and to be exactly as represented.

We also have the new MURDOCK PANEL RHEOSTAT at \$1.00.

DON'T FORGET—THAT 20c you sent for CW catalog covers all additional pages, which will be sent—hot from the press. KEEP POSTED.

BROWN PHONES

Type A adjustable, \$18; Type D non-adjustable, \$16. This is the genuine British Admiralty phone now acknowledged to be the most sensitive phone in the world, BAR NONE.

NEW MURDOCK #56 PHONES, 2000 ohms, \$5.00 postpaid.

Do you know that we are special agents for Grebe Apparatus and have the new CR-8 in stock? \$80.

BOSTON AND VICINITY WILL BE PLEASED TO HEAR OF OUR NEW CONVENIENT LOCATION IN THE HEART OF THE SHOPPING DISTRICT. EVERY NEW CUSTOMER WILL RECEIVE A RADIO REPLY CARD FREE. DX has the habit—why not you?

SOMERVILLE RADIO LABORATORY
176-178 WASHINGTON ST., BOSTON, MASS.

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Old Positive and Negative
At Their Best Can't Give Better Continuous Service Than

WESRAD

With a Store on Each Half of the Cycle
Free Book of Directions—Our Stock Bulletin and Price List
(In a New and Handy Form)—The Only Complete

PRICE DICTIONARY!

At Your Service—

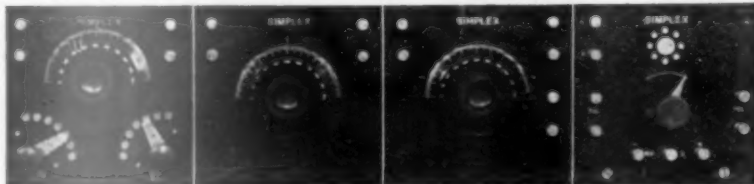
"FOR RADIO ONLY"

WESTERN RADIO ELECTRIC COMPANY

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CALIFORNIA



Unmounted
Variometers
and
Vario-Couplers
\$6.00 Each

Vario-Coupler
\$10.00

Variometer
\$8.50

Variometer
\$8.50

Audion Panel
\$11.00

Amplifier Panel
\$20.00

These four panels form a short wave receiver of unusually high efficiency and appearance, fully described in bulletin #11. Write for it. If your dealer cannot supply you, send your order with his name.

Dealers send for trade discount.

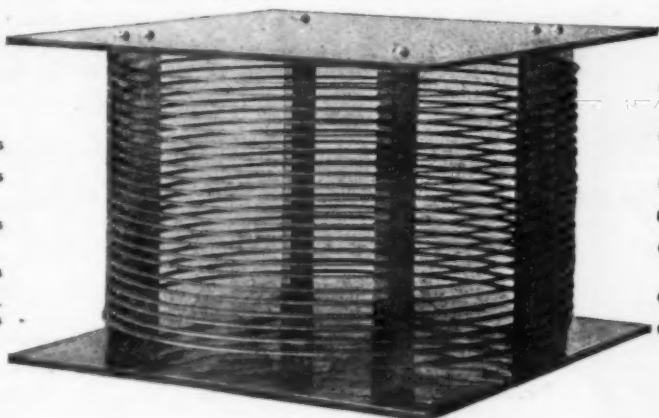
SIMPLEX RADIO COMPANY, 1013-15 Ridge Ave., Philadelphia, Pa.

GET THE NEW COMPLETE RADIO CATALOG OF CRAIG & LOUGHBOROUGH

CINCINNATI, OHIO, FREE. IT DESCRIBES RADIO
TELEPHONES FROM 10 WATTS TO 2 K.W., \$45 TO
\$4000; SPARK TRANSMITTERS, RECEIVING EQUIP-
MENT, ANTENNA MATERIALS, AND THE MOST COM-
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LOW. QUALITY AND SERVICE OF THE BEST.

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CW Plate
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CW Filament
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CW Power
Tubes
CW Rectifier
Tubes
CW Sockets
CW Rheostats
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Microphones
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Transformers

WIMCO CW 100 INDUCTANCE

Get the **BEST CW Inductance**. Real connection clips provided, no uncertain switches which short circuit turns. Entirely insulated on Formica, high conductivity copper, very efficient. Made in 25 and 50 turn sizes, priced at \$10.00 and \$13.50 respectively. Also sold in parts ready to assemble.

We distribute the only complete line of panel type meters in America—Thermoammeters, AC and DC Voltmeters, Ammeters and Milliammeters. You can now equip your set with a complete set of meters all alike.

Big line of high voltage generators and motor-generators reasonably priced—just what you have been looking for.

SPECIAL NOTICE

Grid coils for the above CW Inductance are now supplied so that the circuit described in July QST can be employed—and take it from us it is the **REAL** amateur circuit. Grid coil for the CW 100 Inductance priced at \$2.00. Ask for our new bulletin containing full dope on this circuit—try it on your own set, it's a winner.

October Antenna Specials

Now is the time to remodel your antenna and we are especially prepared to supply your needs in solid copper, stranded copper and copper-weld aerial wire.

Ask about the New Air Gap Type

Antenna Insulators—wonderful for CW—priced right—positively superior to present forms and materials.

Send for special Antenna Material Bulletin or send 15c in stamps for catalog and complete literature.

8ZV WIRELESS MANUFACTURING CO. 8ZV

CANTON, OHIO

WIMCO apparatus is distributed in Canada by Ontario Radio Laboratory,
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An Addition to the "IDEAL" Line



PRICE \$2.00

"9XAH"

The demand for a Filter Condenser which will stand up under extremely high pressures and yet perform its duty in the most efficient manner has long been apparent.

The Ideal Type CWC 1 Mfd. 1000 Volt Guaranteed Filter Condenser will completely fill the above mentioned need.

Purchase Ideal Condensers from the following dealers or direct:

Alamo Sales Corporation,
Benwood Company, Inc.,
Chicago Radio Laboratory,
Hemple Electric Company,
Klaus Radio Company,
Leo. J. Meyberg Company,
Nola Radio Company,
Philadelphia School of Wireless,
Somerville Radio Lab.,
Precision Equipment Co.,
T. & H. Radio Company,
Northern Radio Co.,
Wireless Manufacturing Co.,

Indianapolis, Ind.
St. Louis, Mo.
Chicago, Ill.
Omaha, Nebr.
Eureka, Ill.
San Francisco, Calif.
New Orleans, La.
Philadelphia, Pa.
Boston, Mass.
Cincinnati, Ohio
Anthony, Kansas
Seattle, Wash.
Canton, O.

SEND 10c FOR CW CATALOG

"9XAH"

IDEAL APPARATUS CO., 1901 E. Louisiana St., Evansville, Ind.

KEYSTONE WIRE

Wire for every Wireless Purpose

MAGNET WIRE

We are prepared to furnish best grade magnet wire on $\frac{1}{4}$ and $\frac{1}{2}$ lb. spools at the following prices:

Size B & S Ga.	PRICE PER		LB. SPOOL	
	Single Cotton	Double Cotton	Single Silk	Single Enameled
No. 22	\$0.56	\$0.68	\$0.62	\$0.45
No. 24	.60	.77	.67	.47
No. 26	.60	.88	.71	.49
No. 28	.75	1.10	.85	.52
No. 30	.85	1.24	.97	.53
No. 32			1.15	.55
No. 34			1.52	.59
No. 36			1.77	.69

Price of $\frac{1}{2}$ lb. spools double above list.

All prices are net and include cost of spool and delivery charges via Parcel Post to any Post Office address in the United States; safe delivery guaranteed.

Send for Circular 21-A giving prices on other sizes, insulations and quantities of Magnet Wire. This circular lists "WIRE FOR EVERY WIRELESS PURPOSE." Dealers - Write for our proposition

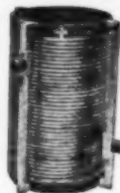
KEYSTONE WIRE COMPANY

P.O. BOX 120



SCRANTON, PA.

A
ACE
E



ACE CW
Inductance \$6.50
Complete, but
without sliders... \$5.00

The ACE CW Inductance is unquestionably the ideal unit for amateur experimental work in connection with CW Circuits. Comprises 40 turns of No. 10 HD bare copper, space wound on a heavy formica tube $4\frac{1}{4}$ " o.d. Two heavy phosphor bronze sliders moving on solid $\frac{1}{4}$ " rods permit of single turn variation and assure positive electrical contact.

The ACE Receiver Cord Binding Post eliminates the harmful "cross pull" resulting when ordinary binding posts are employed. This condition causes excessive wear and tear to take place near the terminals or tips of the cord, eventually resulting in breakage. The ACE Post protects your cords and provides for a positive electrical connection.

We Carry in Stock at All Times a Complete Line of Radio Accessories

Send 3c in stamps for catalog.

THE PRECISION EQUIPMENT CO.
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A.R.R.L. Peebles Corner 8XB
CINCINNATI, OHIO

"You may pay more but you can't buy better"

Announcement

to the

Radio Amateurs of America

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The fact that all Radio Corporation apparatus is manufactured by the General Electric Co. is sufficient guarantee of quality. Each device is exhaustively tested, and is not offered for sale until we are confident that no further improvement is possible.

A valuable forty page catalogue on C. W. and other radio apparatus is now available. This important book is divided into two sections, the first giving construction and operating data for C. W., I. C. W. and telephone sets; the second section, a catalogue of modern and high grade radio transmitting and receiving apparatus.

Send for your copy now, the price is 25 cents postpaid.

Dealers throughout the United States will want to handle this new line. Write us today for details

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Sales Division, Commercial Department, Suite 1803
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Lower Prices for Fall Equipment

AERIAL WIRE

We have been successful in purchasing a new shipment of Aerial Wire. This wire is pure Lake Superior Solid Copper, No. 14. We have 100,000 feet for you at wholesale prices.

PRICE

Per 100 ft.....\$.58
Per 500 ft..... 2.75
Per 1000 ft..... 5.50
Nearly 2ft. for 1c.

A REAL GOOD SWITCH LEVER

58c

Knob 1 1/4" diam.
(Marconi)
LEVER—Special
Alloy. (Silver
plated)
BUSHING—
Brass. Fits all
panels from 1/4"
to 1/2" in thick-
ness.
GUIDE BUSH-
ING—Nickel
Plated.
ADJUSTMENT
SCREW—2"
long, complete
with nuts.



FOR 35c.

It is now a recognized fact that the R. T. S. grid condensers are superior. They are made of the best material and are TESTED before leaving the factory.

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RTS Grid Condensers .0005 MF .. each, 35c
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SILK COVERED WIRE

Think of it! No. 26 double covered green silk wire for only 62c per 1/4 lb. No charge for spools.

CAN YOU BEAT THESE PRICES?

Radio Testing Station,

DEPT. 3

BINGHAMTON, NEW YORK



Chicago Radio Show News About

THE LEADER BINDING POST

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"Corporal" THAT'S ALL FRIENDS AND WE THANK YOU

25 amp.
Made in five sizes

Designed Right

Stay Tight

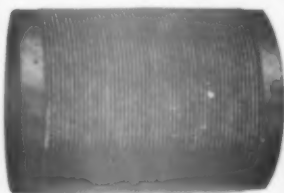
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THE H. H. EBY MFG. CO.,

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"Ensign"
1/2" size
Made in 2
sizes, 3
styles



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single or two coil wind-
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Threaded Formica Tube
\$3.75

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DEALER
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Mfg. by
Standard Radio Co.
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**DOUBLE COIL
CHOKES**
SR-6 500MA \$7.50
SR-6a 150MA. .. 6.00

Why Condensite is used for insulation in the Radio Field

The proper selection of insulation in the radio field depends upon a thorough knowledge of the conditions to which the material is subjected in use, and the properties which it possesses that adapt it to meet those conditions.

There are innumerable natural substances and manufactured products that are used for electrical insulation, such as paper, wood, glass, rubber, porcelain, silica, etc., where one will serve well however, another may not be practical.

It therefore depends upon the knowledge, experience and good business judgment of the radio manufacturer in selecting the proper insulation, whether or not he has ex-

ercised his discretion wisely can sometimes be determined by a very simple test.

Nearly all radio work that is fabricated by molding has the same general appearance to the casual observer, due to the uniform black color, but Condensite can be readily distinguished by simple tests for some of the properties which all good radio insulation should possess.

Thus shellac will soften if placed on a radiator or in the hot sun or if a match is applied, or it will readily shatter; hard rubber likewise is easily affected by heat, loses its finish and decreases in insulation resistance with age. All of these conditions are without effect upon Condensite.

It is your right to receive the best value for your money; insist that the next radio equipment you buy be made of Condensite.

Specify

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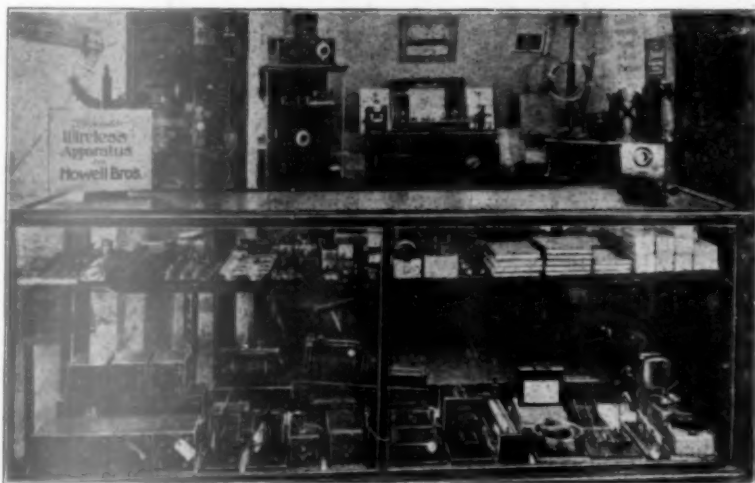
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SIXTH AND BROAD STREETS,

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RELIABLE RADIO APPARATUS

For Amateurs and Commercial Operators

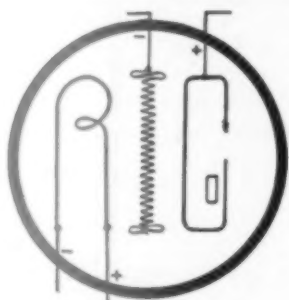


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Phones
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2 or 3 stage Radio-Frequency Amplification.

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NEW R F TRANSFORMER

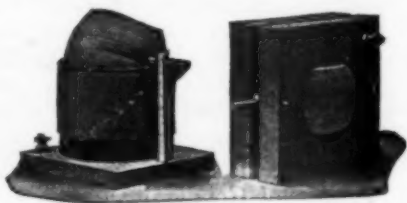
150 Meters Up! !

**AMATEUR LONG DISTANCE
ON LOOP AERIAL**

See advertisement next month.

Radio Instrument Co.

10th & D, N.W. Washington, D.C.



Variometers
Couplers **\$3.75**
EACH

These instruments embody finest workmanship and best materials, all wooden parts genuine mahogany, coupler primary wound on formica tubing. Metal parts of brass. Wound for maximum results on short wave work. Will tune to 600 Meters with small condenser. Shafts $\frac{1}{8}$ ". With Chelsea Dial and Knob \$1 extra. Send for bulletin describing unwired regenerators and other apparatus.

FREDERICK WINKLER, Jr.

304 COLUMBUS AVENUE

New York City, N. Y.

AMATEURS SAY "TRY WECO"

It Means Quality, Service and Satisfaction
GOOD GOODS COMPLETE STOCK PROMPT SERVICE

Distributors and Dealers for All the Leading Makers.

Postage Prepaid On Any Order Over One Dollar—Goods Shipped All Over the World.

DETECTOR AND AMPLIFIERS

Grebe Two-step with automatic filament control Type RORK	\$55.00
Grebe RORD Detector and two-step automatic filament control	75.00
Clapp-Eastham ZRD tube control panel	12.00
Clapp-Eastham ZRD one stage amplifier	18.00
Clapp-Eastham OZ two stage amplifier	40.00
Remler Detector panel #330	8.00
Remler Amplifier less transformer and cam switch Type 331	7.00
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Murdock No. 35870
Murdock No. 35990

VARIABLE CONDENSERS

Catalog No. 43 plate—.001 mfd	
366	4.75
367	4.50
3680 Panel type	4.00
3661 Panel type	4.25
3662 Panel type	5.00
Catalog No. 23 plate—.0005 mfd.	
368	4.00
3690 Panel type	3.25
3681 Panel type	3.50
3682 Panel type	4.25

CRYSTAL

Galena per chunk25
Silicon per chunk25

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DeForest Dust Proof Di01	2.60
Jove No. 8854	1.80
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Remler 1/4 or 1/2 shaft	1.30
Clapp-Eastham F-800-H new type75
Corwin	1.30

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Remler No. 9660
DeForest75
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For Cage Antenna Construction 3 ft. Diameter, white wood, light	2.00
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At low prices. Send for prices.

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DeForest Single U. L. C. 200	1.90
DeForest Double U. L. C. 300	4.00
DeForest Triple U. L. C. 400	5.30
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Remler	6.50

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Weco No. 1 Ball type 2 1/2"40
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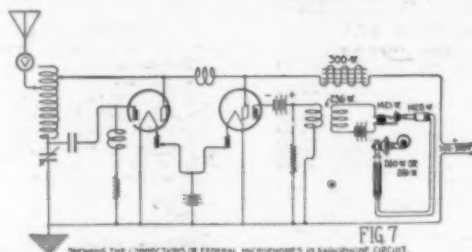
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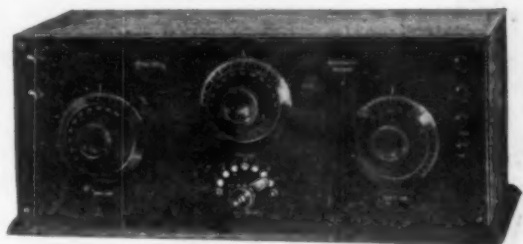
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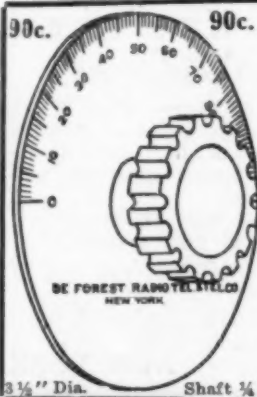
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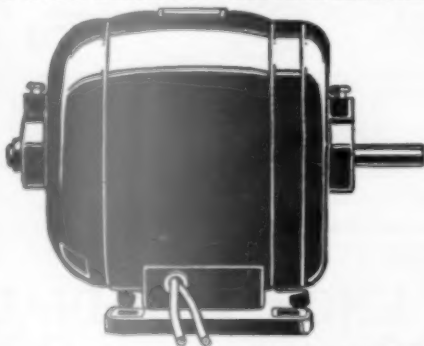
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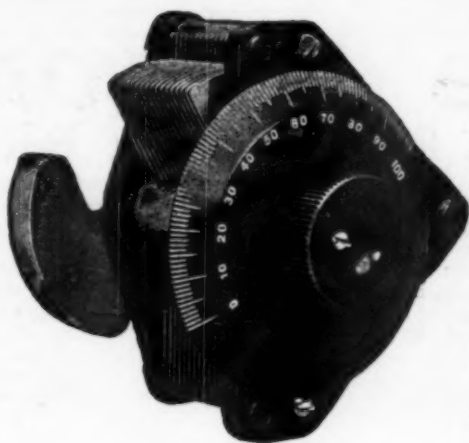
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3	.0011m.f.	With Dial	$4\frac{1}{2} \times 3 \times 4$	2 lbs.	4.75
3	.0011m.f.	Without Dial	$4\frac{1}{2} \times 3 \times 4$	2 lbs.	4.35
4	.0006m.f.	With Dial	$4\frac{1}{2} \times 3 \times 3\frac{1}{2}$	1 $\frac{1}{4}$ lbs.	4.25
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Top, bottom and knob are genuine bakelite, shaft of steel running in bronze bearings, adjustable tension on movable plates, large bakelite dial reading in hundredths, high capacity, amply separated and accurately spaced plates.

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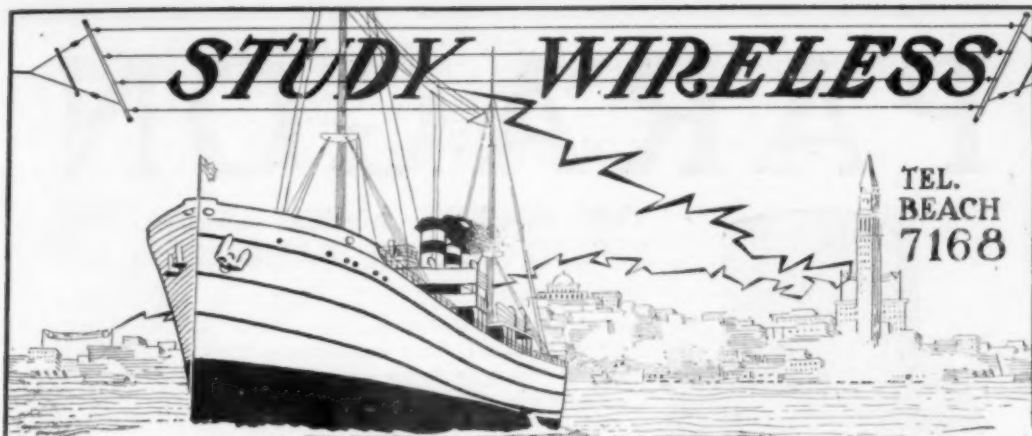
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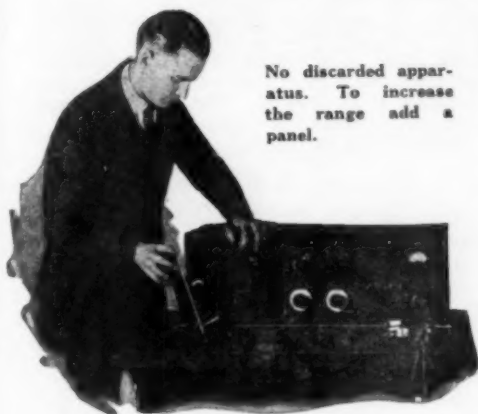
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Model 429 A.C. Voltmeter
4 1/4 inch Diameter

Weston

Model 429

Low Range A. C. Voltmeter

to measure and adjust the filament voltage. The Model 429 Low Range Voltmeter has an exceptionally high resistance, making it ideal for use with tubes.

Instruments of this size are available as A.C. Ammeters, Milliammeters and Voltmeters; D.C. Ammeters, Milliammeters, Voltmeters and Millivoltmeters; A.C. and D.C. Wattmeters; and Radio Frequency Ammeters. *Bulletin sent on request*

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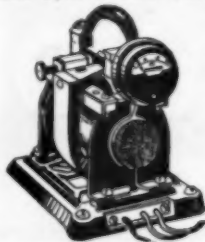
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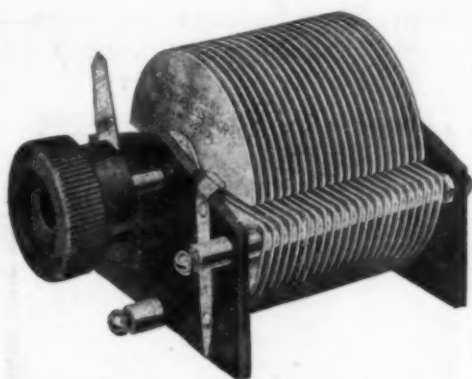
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No. 310	31 " " .0007 m. f. " "		\$4.30
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No. 24	.30	.33
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No. 1632—1 tap 45 Volt Var. Battery.
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3 3/4 lbs.
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These new types are not made of the same size cells as a small size "B" Battery. The volume of one of the cells in these types is 4.7 C.W. inches, as compared with 2.5 C.W. inches, which is the volume of a cell used in small "B"s. So you can see, that the life of these two new types are almost double the life of the small "B"s. No. 1632 has 1 tap at 22 1/2 volts.

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1625 Variable	3 x 4 x 6 3/8	5	22 1/2	2.25
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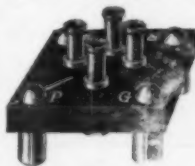
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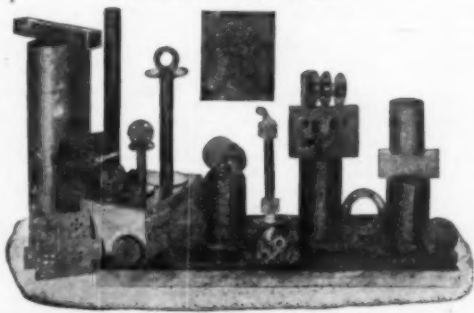
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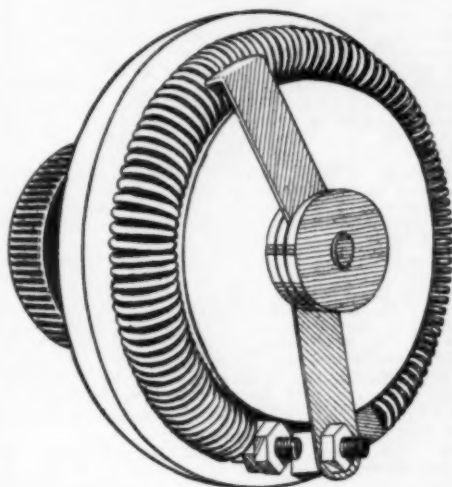
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Current capacity 6 amperes.

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Geared triple mounting with five honeycombs, \$10.00. Murdock .001 \$3.50; .001 without case \$2.00; 3,000 meter coupler \$7.00; E. R. \$2.00, inch coil \$3.50, or everything for \$25.00. Horace Goss, Essex, Conn.

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SELL: New Regenerative Receiver \$18; One Kilowatt Spark Gap, \$23.30; O.T. \$4.50; DeForest Crystal Detector and Galena \$2.50; Electrolytic Interrupter \$2; Bunnell Key \$23.30; Buzzer \$0.65; None postpaid. Alva Smith, Caledonia, Minnesota.

SALE: Eight slightly used 200-3000 meter bank wound Clapp-Eastham Radion navy type loose couplers. New \$14. \$9.50 apiece postpaid takes them. Satisfaction guaranteed. D. A. Hoffman, 50 S. Balch St., Akron, Ohio.

WILL TRADE my $\frac{1}{2}$ K.W. Transmitter complete for Grebe Regenerative Receiver, or any good make. Write me for particulars, P. J. Perdue, 718 Delaware St., Salem, Va.

NEW SYNCHRONOUS MOTORS: \$27.50—1-5 H.P., 220 volt, 1800 R.P.M. Also 1-8 and 1-4 H.P. 110 and 220 volt synchronous motors at very low prices. Stock Limited—order at once. Stahl Rectifier Company, 1401 W. Jackson Blvd., Chicago, Ill.

WANTED IMMEDIATELY: 2 K.W. United Wireless "Coffin" Transformer. Must be in perfect condition, Bernard Locke, Blackwell, Okla.

BARGAIN: Beginner's outfit including 3500 meter navy coupler, Arnold detector cabinet, Murdock variable condenser and fones. Good shape. Worth \$45 sell for \$30. Further information send to E. M. Douglas, Short Hills, N. J.

Z-NITH REGENERATOR for sale. Guaranteed OK \$35 IBES, 99 Stanwood St., Providence, R. I.

FOR SALE: DeForest nine panel receiver with thirteen coils, \$50; $\frac{1}{2}$ K.W. transmitter, \$50. Write for particulars. Howard Toft, 282 Oak St., Perth Amboy, N. J.

Two 2-Filament Audiotrons, each \$3.50; Adapter 75c. Kary Canatsey, 202 E. Jackson, Iowa, Kansas.

FOR SALE: Navy type Coupler, 3000 meters, \$6.00. Stuart Cope, Highland, Middletown, Conn.

Stop! Look! and Act! V.T.'s. With each radiotron U.V. 200 V.T. detector or A-P Moorhead V.T. detector or Radiotron U.V. 201 V.T. Amp. or A-P Moorhead V.T. Amp., we will supply free of charge your choice of either a Murdock V.T. socket improved contact type or a Remler Bakelite smooth running rheostat latest type. Radiotron U.V. 200, \$5; Radiotron Amp. V.T. U.V. 201 \$6.50; Moorhead A-P detector \$5.00; Moorhead A-P Amp. V.T. \$6.50 Remler Bakelite Rheostat latest type, \$1; Murdock V.T. socket \$1; Clapp-Eastham panel mounting rheostat of 4 ampere capacity or Murdock socket supplied free of charge with each \$8.00 U.V. 202, 5-watt Radiotron power tube for C.W. or Radiophone transmission. We absolutely guarantee the foregoing apparatus. Only new and high grade equipment carried in stock. All orders are filled within twelve hours and shipped postpaid and insured, thereby saving time and money. Remember us. The Kehler Radio Laboratories. Dept. A., Abilene, Kansas.

TRADE OR SALE: 2 K.W. 500 cycle generator. Want $\frac{1}{2}$ K.W. similar machine with exciter. Radio 71Z, Chas. Burson, 716 East 42 St., Seattle, Washington.

FOR SALE: Complete One K.W. transmitter, practically new \$75.00 cash. Otto S. McDaniel, 1436 Carr, Sedalia, Missouri.

FOR SALE: Complete spark set of 2JJ with record over 3,000 miles. Cheap. Write for particulars, John J. Kulik, 113 Mahar Ave., Clifton, N. J.

WANTED: DeForest Variometer Type RJ 1005 Glenn Seever, 904 5th St., S. W., Canton, O.

MUST SELL 9AXZ: 5 5-watt W.E. V.T. 2's \$14 each, all \$65; 3 Rept. \$1 each; 3 Rheostats \$1 each; 1 Acme mounted C.W. 200 watt 0-350-550 V. \$19; 1 Burned out Holtzer-Cabot 500 V. Gen. 200 watt. \$12; 1 Persons Elec. 3500 R.P.M. $\frac{1}{2}$ H.P. Motor (new) \$58, 1-2 Cycle 1 H.P. Air Cooled Gas Engine \$25; 1-8 volt 2 amp. Gen. \$5; 1 Amrad Wavemeter \$4.50; 2 L1500 Duo Coils \$4 each and 1 L750 \$1.75; Terms $\frac{1}{2}$ cash, balance C.O.D. Also a Fox Portable Typewriter No. 2 Brand New \$42 cash. Box 263 Jonesboro, Ind.

2 K.W. Key \$3.50, Omnigraph and extra dials \$15, Step-Down transformer \$5, Navy Coupler \$6. Alva Flippin, Rainier, Oregon.

EDISON B Battery elements. Make your own. Can be recharged and lasts for years. Harry Morrell, 52 Goffe St., New Haven, Conn.

BARGAIN: $\frac{1}{4}$ K.W. Winger Transformer, \$9.00; Thordarson Rotary \$10.00; Benwood 8-Stud Rotor, \$4.00. O. Hartwig, 4430 Princeton Ave., Chicago, 9AXK.

SELL: 1" transmitter, complete; 2 tuning coils; 1 Aerial switch; 2" coil with gap, condenser, key; 1 telegraph set; back copies Experimenters, Radio News, Wireless Age. Write, 74 W. Rockland St., Phila.

SELL: New Acme Mounted Transformers only \$35; Quarter inch glass plate oil condenser \$15; DeForest triple geared mounting and coils 180-20,000 only \$23. E. C. Espy, Vandergrift, Pa.

FOR SALE: Acme $\frac{1}{4}$ K.W. transformer, Murdock Rotary Gap and oscillation transformer, new, \$30.00. R. A. Hilferty, Maynard, Mass.

WRITE for our price lists! Attractive offers! The Dalles Radio Supply Co., Box 27, The Dalles, Oregon.

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and build your own apparatus. Here are two necessities that you can purchase from your dealer or postpaid.

FADA INDUCTANCE SWITCH

A brand new FADA part. $1\frac{1}{4}$ " radius blade. Knob $1\frac{1}{4}$ " dia. at bottom and made of heat resisting Thermoplas. Lever is securely pinned to the knob. The best switch lever designed to date.

\$0.50 each

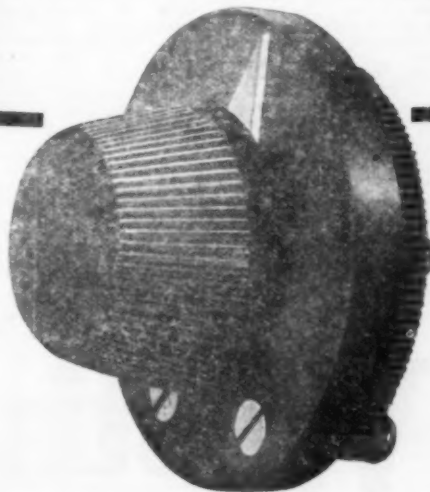
PANEL MOUNTING RHEOSTAT

Improved by the new FADA Thermoplas knob and a shorter pointer of 1" radius Thermoplas base, smooth adjusting and more reasonably priced than others. Beware of imitations—get a FADA.

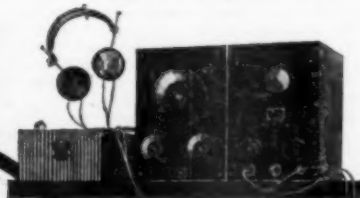
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FRANK A. D. ANDREA

Manufacturer of FADA Radio Products
1882-B Jerome Ave., New York City



"Radio In The Home"



With Westinghouse Simplified Receiving Apparatus



RECEIVING SET No. 1
Type RA Tuner.....\$65.00
Type DB Crystal Detector... 5.00
Brandes Superior Phones... 8.00
Receiving Antenna Outfit... 7.50

ADDITIONAL ITEMS
For Distant Reception and Loud
Speaking
Type DA Detector Amplifier \$65.00
Vacuum Tubes (4 required)
each 6.50
Type CB Loading Coil.... 5.00
Dry Battery (2 required)
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Storage Battery..... 24.00
Pacnet Plug Adapter..... 2.00
Victrola Attachment, or
Grafonola Attachment... 15.00

FOR BATTERY CHARGING
Rectigon Battery Charger...\$18.00
Extra bulb for same.....\$4.00

RECEIVING SET No. 2
Type RC Receiver.....\$125.00
Vacuum Tubes (4 required)
each 6.50
Type CB Loading Coil..... 5.00

Receiving Set No. 1 consists of a highly efficient single-circuit tuner; a supersensitive crystal detector; a set of head phones; and a complete antenna outfit.

It has a wave-length of 180 to 700 meters.

Receiving Set No. 2 consists of a single-circuit tuner; a three-tube, two-stage detector-amplifier; four vacuum tubes (one spare); a loading coil; two dry batteries; a storage battery, head phones; and a complete antenna outfit.

It has a wave-length range of 180 to 700 meters. The addition of the loading coil allows the reception of signals on 1600 to 2800 meters wave length, such as Arlington time.

Folder 4476 gives interesting details. Send for it.

Dry Battery (2 required)
each 3.50
Storage Battery 33.00
Brandes Navy Phones..... 14.00
Pacnet Plug Adapter..... 2.00
Receiving Antenna Outfit.. 7.50

ADDITIONAL ITEMS
For Loud Speaking
Victrola Attachment, or
Grafonola\$15.00
FOR BATTERY CHARGING
Rectigon Battery Charger... 28.00
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East Pittsburgh, Pa.

Westinghouse

—FOR YOUR CONVENIENCE—

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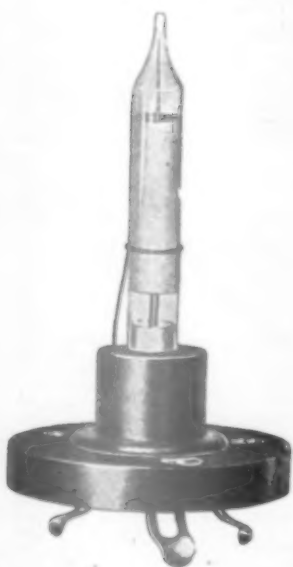
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CONNECTICUT RADIO

THE NEW ELECTRON TUBE *Detector and Self Amplifier*

(Fully protected by patents in the principal countries throughout the world)



THIS Tube, the Sensation of the Chicago Radio Show, is new in principle, and in operation. Hence it offers these notable advantages:

- No B Batteries
- No Tickler
- No Grid Leaks
- No Filament Adjustment
- High Selectivity
- Extreme Sensitiveness
(Equal to one stage of amplification)
- Much longer life
- Uniformity of Tubes
(All equally good)

It represents the result of over four years exhaustive research, the study of nearly 2000 tubes, with complete records of the characteristics of each one. It has had thorough tests in our own research laboratories, and months of continuous operating use.

Only after gaining this full knowledge of its characteristics, its remarkable possibilities, and its practical usefulness, are we ready to offer it to radio workers, as a forward step in a great field.

Made up in the complete CONNECTICUT Detector Set at \$35.00; Detector Unit alone, \$12.00; Tubes (for replacement) \$3.50.

We shall be glad to furnish you with further information on request. Or ask your dealer to show you the set.

CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden Connecticut

90 Britannia Street

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CONTINENTAL NEWS

OCTOBER, 1921

Published occasionally in QST by Continental Radio and Electric Corporation

PARAGON scores again---

The hearty endorsement of Paragon R.A. Ten by leading amateurs speaks for itself. Last month we printed 2ZL's enthusiastic letter. This month we have selected this similar statement from 2ZM as representing the opinions of hundreds of amateurs who have been astonished and delighted with the results they have secured,—

"Wish to acknowledge receipt of my Paragon in good shape.

At the same time, I wish to say that I have gotten some surprising results having read a number of DX stations that were never heard before, with my other receivers, even in the winter time.

I can truthfully say that the Paragon gives better results for all around amateur work than any receiver I have ever used, and will highly recommend it to my fellow amateurs.

(Signed) L. Spangenberg,
Radio 2ZM.

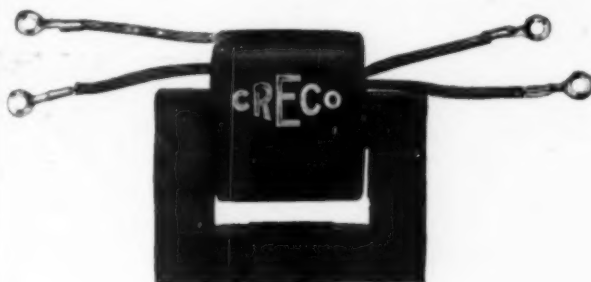
Ask your Radio dealer

to show you a Paragon R.A. Ten regenerative receiver. If he hasn't one in stock, he will gladly get one if you ask him for it. The seals have now been broken to show you the splendid inside construction. Examine a Paragon carefully—convince yourself that these leading amateurs have not overstated one particle in their complete approval of Paragon results,—and that Paragon is well worth its \$85.00 dollar price.

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Only a few left—

If you haven't a Continental catalogue, we advise you to send a quarter for your copy at once.



CRECO

Amplifying Transformer

High in quality---
Low in price **\$3.25**

In keeping with the Creco policy of distributing apparatus of recognized quality, at reasonable prices we offer this transformer. It is an instrument of utmost mechanical and electrical efficiency, perfected to all the needs of present day VTs. Sold complete, ready for mounting. Important features are:

Unequalled audibility and sensitiveness.

No holes in core, eliminating magnetic leakage.

No castings used anywhere, etc., etc.

Such a simple, yet efficient instrument should interest you at any price. But at the price of only \$3.25 (far lower than any other transformer) you will have to act quickly. We cannot guarantee to keep production of an instrument like this up to the demand. *The best thing to do is to order Creco transformers for all your VTs at once.*

CONTINENTAL RADIO AND ELECTRIC CORP.

Exclusive Wholesale Distributors for

Phonetrone & PARAGON R.A. TEN

J. DiBlasi, Sec.

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Dept. B29, 6 Warren St., New York City

AMRAD

The Recognized Symbol of Superior Performance



New Quality Receiving Apparatus

Those who have seen it—and they are many—are very enthusiastic.

All the discoveries, developments and improvements in radio design and manufacture have contributed to make the above Amrad achievement absolutely unequalled for modern short wave receiving.

Chief among the features are (1) Back Connections hidden from view, (2) Non-mechanical Vernier Controls which hunt down the wary C.W., (3) Unit Construction allowing economical expansion of the Set, (4) Compact Designs which increase efficiency, minimize space and reduce weight and (5) Quality appearance due to rich Mahogany Cabinets with rounded corners, glossy-black

beveled Dials, Finished Panels, brilliant white engraving, modern aluminum frame construction inside, etc.

No. 2596 is a short wave Regenerative Tuner with vernier controls. Price \$45.00. No. 2634 is a Detector 2-stage Amplifier including two celebrated Amrad Ampliformers, (amplifying transformers) Price \$47.50. In combination, these two products give a high class receiving station of unequalled efficiency and quality.

We don't ask you to "swallow our claims." We do ask you to investigate for yourself. Write us for descriptive Bulletin L. Go to the nearest Amrad Dealer listed in August QST or October Radio News and examine the apparatus itself. COMPARE.

The Twin-R Synchronous Gap Motor ($\frac{1}{4}$ H.P. Frame) has met with wide favor. Price only \$25.00. Send for Free Bulletin T.

New Amrad Receiving Specialties include enclosed Ampliformers, Vernier Variometers, bevelled Dials, Rheostats, Grid Leaks, Fixed Condensers, etc. Send for Bulletin N.

Our New Variometers and Vario-Couplers, \$6.10 to \$13.00, should be investigated by every prospective purchaser. Bulletin O describes them.

DEALERS—Over 60 reputable dealers over the country now stock the Amrad Line. Several good districts are still available to bona fide retailers. Write for our New Trade Policy.

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